Bayer

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February 26, 1997

Ms. Estena McGhee
RCRA Operations Branch
USEPA Region III
841 Chestnut Street
Philadelphia, PA 19107

Subject: **Transmittal of Interim Measures Report**
Former Textile Dye Plant
Damascus, Virginia
Docket No. RCRA-111-016-CA

Dear Ms. McGhee:

The Bayer Corporation (Bayer) is pleased to submit three copies of the Draft Interim Measures (IM) Final Report for the Former Textile Dye Plant in Damascus, Virginia. Bayer has completed the IM work described in the IM Work Plan, and modified in several discussions with you. Work was performed during the period June 4, 1996 through February 22, 1997. (The final wrap-up items were just completed last week). This IM report, prepared for Bayer by ICF Kaiser Engineers, details the work that was performed, the results of all sampling performed during the IM work and the final post-excavation risk calculations.

Based on the objectives and criteria specified by USEPA prior to beginning the IM work, Bayer believes that the site has now been fully remediated. All sampling locations where lead concentrations exceeded 1,000 mg/kg (the primary criteria) have been excavated and disposed off-site. Extensive pre- and post-excavation sampling has been performed to confirm that the full lateral and vertical extent of the contamination was identified and properly removed. Finally, statistical analyses were performed to verify that the remaining soils in the Southern Non-process Area of the site averaged less than 400 mg/kg (based on the 95% upper confidence limit calculation in four quadrants).

Bayer is currently preparing a post-IM Corrective Measures Study (CMS) Report for submission to USEPA. Our current expectation is that the CMS Report will 1) be the final deliverable needed from Bayer to USEPA on this site, and 2) will document and conclude that no further action will be needed (now that the IMs are completed). We plan to forward the CMS report to you by March 31.

If you have any questions or comments about this IM Report, please call me at (412) 777-7647.

Sincerely,

George R. Fisette

George R. Fisette, P.E.
Manager, Remediation Programs

Enclosures

cc: D. Taylor, ICF Kaiser
K. Nguyen, VDEQ

92186-317-R

AR000311

Draft Interim Measures Final Report

for the
Bayer Corporation
Former Textile Dye Plant, Damascus, Virginia

prepared for submission to:
U.S. Environmental Protection Agency
841 Chestnut Street
Philadelphia, Pennsylvania 19107

EPA

prepared on behalf of:
Bayer Corporation
Bayer Road
Pittsburgh, Pennsylvania 15205

Bayer

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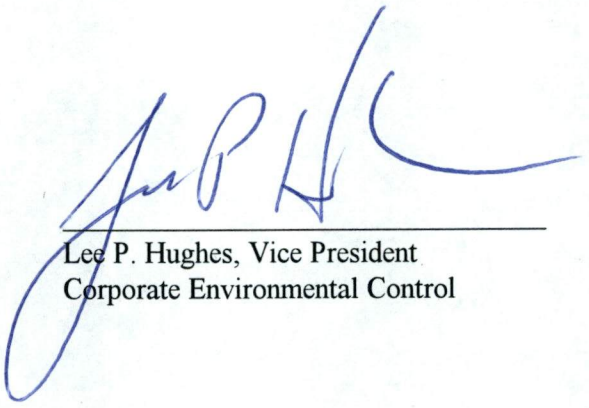
1600 West Carson Street
Pittsburgh, Pennsylvania 15219

ICF KAISER

February 17, 1997

I certify that the information contained in or accompanying this Draft Interim Measures Report is true, accurate and complete.



Lee P. Hughes, Vice President
Corporate Environmental Control

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1.0 INTRODUCTION

1.1 PURPOSE OF THE REPORT

This report presents the results of the Interim Measures (IMs) conducted at the former Textile Dye Plant (FTDP) owned by Bayer Corporation (Bayer) located in Damascus, Virginia[1]. The IMs were performed in 1996 by ICF Kaiser Engineers, Inc. (ICF Kaiser) of Pittsburgh, Pennsylvania.

The IMs were conducted in accordance with the procedures in the Final Interim Measures Work Plan, the Technical Specifications, the Field Sampling/Waste Management Plan, the Erosion and Sediment Control Plan, and the Health and Safety Plan, which were all prepared by ICF Kaiser (ICF Kaiser, 1996, 1996a, 1996b, 1996c, 1996d). The work associated with these IMs was also performed in accordance with the Quality Assurance Project Plan (QAPjP) prepared by Dames and Moore (Dames and Moore, 1990) and the associated amendments to the QAPjP prepared by ICF Kaiser (ICF Kaiser, 1996e).

A Consent Order was signed by Bayer and the United States Environmental Protection Agency (USEPA) which required Bayer to perform a Resource, Conservation, and Recovery Act (RCRA) Facility Investigation (RFI) and a Corrective Measure Study (CMS). The Consent Order was filed as USEPA Docket Number RCRA-111-016-CA and was dated March 30, 1989. This Draft Interim Measures Report was prepared in accordance with Section VI.A of the Consent Order.

Section 1.0 presents an overview of the FTDP Site and outlines the project objectives for the Interim Measures (IMs) work implementation. The original planned scope of work and final scope of work actually completed in the field are summarized in Section 2.0. The Site health and safety procedures are described in Section 3. Section 4.0 describes all activities completed at the Site during the IMs work effort including Site preparation, remedial activities, sampling, and demobilization procedures. Quality assurance objectives and data validation procedures are presented in Section 5.0. A post-excavation risk assessment is presented in Section 6.0. A tabulated summary of the waste materials generated during the IMs work and the final disposition of the wastes is presented in Section 7.0. Section 8.0 presents the original and revised schedule, and the conclusions are located in Section 9.0. References utilized in preparation of this document are listed in Section 10.0.

1.2 SITE BACKGROUND

The FTDP is located adjacent to Beaverdam Creek upstream from Damascus, Virginia as shown on Figure 1-1. The FTDP is located approximately one-half mile south of the Damascus town center and approximately 12 miles southeast of Abingdon, Virginia. The Site occupies a total area of approximately 53 acres, and is separated by fencing into the Northern Process Area and the Southern Non-Process Area. The Northern Process Area consists of approximately 6 acres, and formerly contained the facilities associated with the dye plant. The Non-Process Area consists of the remaining land on the Site, and has previously been used for logging and wood processing activities.

[1]Bayer Corporation has undergone two name changes since the plant was closed. From 1992 to April 1995, Bayer was known as Miles Inc. (Miles). Prior reports for the FTDP were written for Miles. Prior to 1992, Miles was known as Mobay, the name used during operation of the plant.

The FTDP began operation in 1918 and closed in 1986. During this time, the plant was owned and operated by three separate parties. Beaver Chemical Works owned the FTDP from 1918 to 1929. American Cyanamid owned and operated the facility from 1929 to 1981. Mobay Corporation owned and operated the FTDP from 1981 until it was closed in 1986. In 1986, Mobay initiated action to close the plant and to demolish and remove most of the plant's structures. Ownership of the FTDP did not change. In April 1995, Miles Inc. changed its name to Bayer Corporation. A 60- by 140-foot former warehouse and a temporary office trailer are the only structures that remained on-Site after plant demolition.

The FTDP was primarily used for the production of textile chemical dyes including sulfur dies as dry powder or aqueous solution; alizarines; and solvent-soluble sulfur dyes as dry powder or paste. The plant's highest production period (i.e., greatest volume and variety of products) was between 1929 and 1978, during American Cyanamid's ownership. Past activities which may have contributed to environmental impact during operation of the FTDP include land disposal activities; use of surface impoundments for wastewater treatment; and areas of former chemical use, storage, and transport associated with manufacturing operations.

Prior to 1918, a wood processing facility was operated in the center of the Southern Non-Process Area. The facility covered approximately 10 acres. Aerial photographs show this facility continued operation through 1935. A 1953 aerial photograph shows the facility had been demolished and stacks of lumber were stored in its place. Information on past operations at the wood processing facility is scant, but based on interviews with residents of Damascus, activities at the facility were consistent with a lumber mill and/or tannin extraction facility. No known or reported activities related to chemically preserving wood products occurred at the facility. The remaining areas of the Site (approximately 39 acres) are either naturally-forested land or land reverting to forest.

1.3 PROJECT OBJECTIVES

Bayer completed the RFI 1994 and submitted the Final RFI Report (Revision 2) on November 15, 1996 (ICF Kaiser, 1996f). Based on the results of the RFI, Bayer and USEPA agreed that a process consisting of IMs, followed by a Post-IM Corrective Measure Study (CMS) report would be the most efficient way to complete the RCRA Corrective Action process at the Site. The IMs were conducted to reduce the levels of known contaminants on-Site and to improve the aesthetic appearance for future uses. Ultimately, Bayer hopes to transfer a portion (the Southern Non-Process Area) of the FTDP to the City of Damascus for use as a Recreational Vehicle (RV) Park. Therefore, some of the IMs were conducted to reduce or eliminate sociological environmental concerns associated with the property transfer. Accordingly, the objectives of the IMs were:

- Removal of seven hot spots with elevated lead concentration in surface soils (six in the Southern Non-Process area, and one in the Northern Process Area),
- Removal of colored soil from three areas (one of the colored soil areas had elevated lead concentrations),
- Removal of the contents of the Flood Debris Landfill (which also contained surface soils with elevated lead concentrations),
- Demolition of the warehouse building (the only permanent structure remaining on-Site),

- Placement of a soil cover over the Northern Process Area, and
- Improvement of Site stormwater management controls.

The USEPA established two criteria defining when removal actions were complete in areas that contained soils with elevated lead concentrations. First, remove all soil (based on known samples) at the Site containing total lead concentrations that are greater than 1,000 mg/kg. Second, the 95% upper confidence limit (UCL) of the remaining total lead concentrations must be less than 400 mg/kg in all of the four quadrants of the Southern Non-Process Area. If the 95% UCL is exceeded, additional soil will be removed in a way that will result in a reduction to the 400 mg/kg level. This cleanup criteria was applied to samples collected during the RFI and confirmatory samples collected during the IMs.

1.4 PROJECT ORGANIZATION AND RESPONSIBILITIES

Bayer had overall responsibility for scoping and performing investigation and/or construction activities to comply with state and federal requirements. Bayer retained ICF Kaiser to plan, manage, implement and report on the IM activities. ICF Kaiser executed the work described in this report with its own Pittsburgh-based employees, supplemented by specialty subcontractors and local resources. The organization and responsibilities associated with this project are shown in Figure 1-2. The following provides a brief summary of the key personnel in the organization and their authority and responsibilities related to the IM activities.

1.4.1 Program Manager

The Program Manager was Mr. George R. Fisette, P.E., of Bayer. He acted as the contact with USEPA for all matters concerning the IMs. He had overall responsibility for the conduct of project activities. He directed and oversaw the efforts of ICF Kaiser.

1.4.2 Project Manager

The Project Manager for ICF Kaiser was Mr. Douglas Taylor, P.E. He was responsible for the implementation of the IMWP. He was also responsible for the project budget, master schedule, all deliverables, and team performance. In addition, Mr. Taylor was responsible for keeping Bayer's Program Manager informed of work progress.

1.4.3 Field Project Coordinator

The Project Coordinator, Scot Lewis, was the main interface between the field staff and the Project Manager. The Project Coordinator implemented the overall project plans through day-to-day direction of field activities. Principle responsibilities included: establishing and maintaining effective communications with the Project Manager, other ICF Kaiser personnel and contractors; execution of the project work plans; review of contractor payments; and maintaining on-Site documentation. QA/QC requirements during design and implementation of IM activities were also the responsibility of the Project Coordinator. He was responsible for scheduling and assigning tasks to field staff. Mr. Lewis was supported by two field superintendents; Mr. George Pennetti and Mr. Greg Melanowski. One of these field superintendents was on-Site at all times throughout IM activities to direct field workers.

1.4.4 Project Health and Safety Officer (ICF Kaiser)

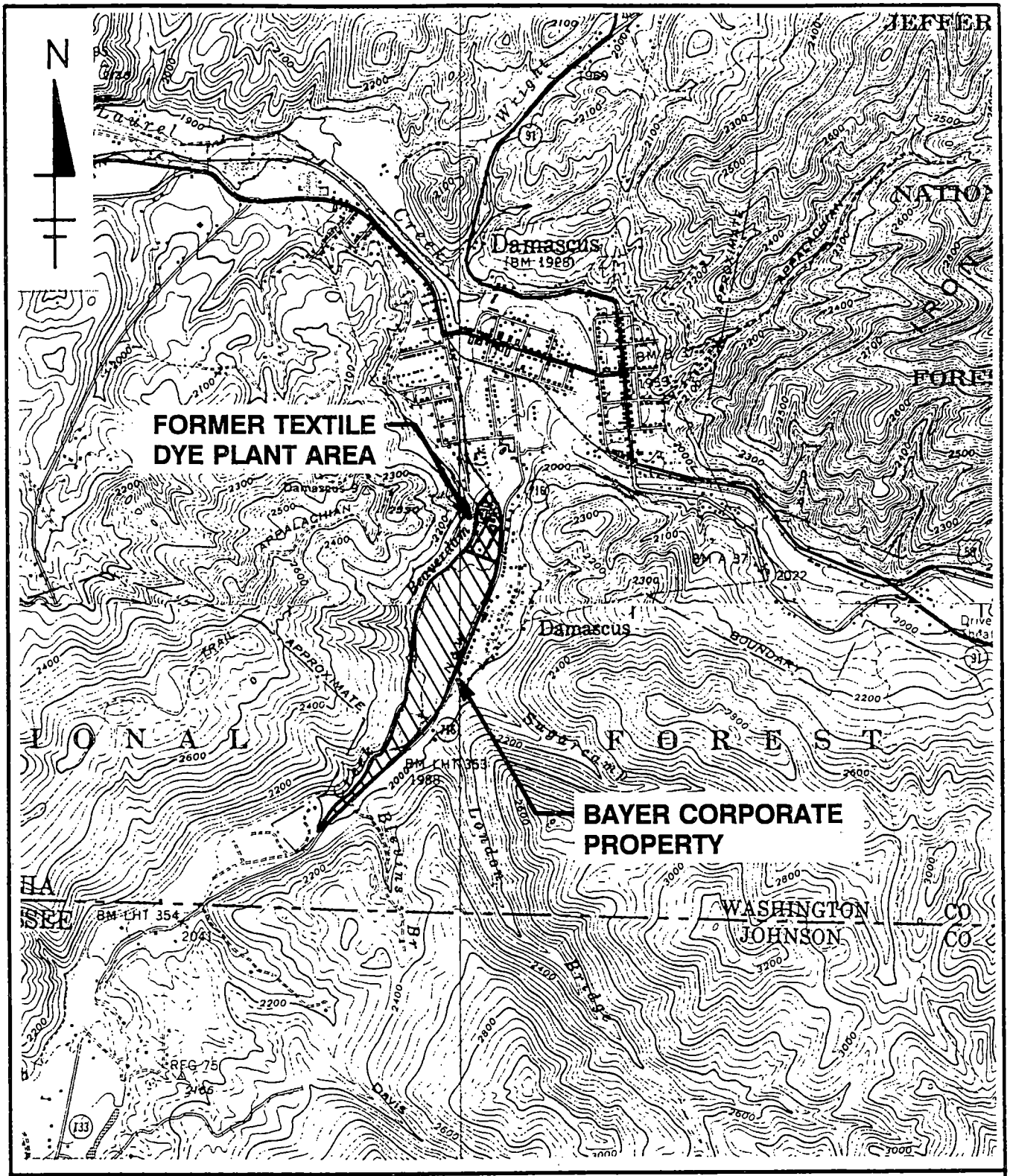
The Project Health and Safety Officer, Dan Welshons, was directly responsible to the Project Manager for development, coordination, and implementation of the Site Health and Safety Plan, and for the general protection of all personnel during Site activities. Mr. Welshons, a Board Certified Safety Professional, visited the Site on three occasions to train staff, audit and monitor operations, and perform personnel air monitoring.

1.4.5 QA Officer (ICF Kaiser)

The QA Officer, Dick McCracken, was responsible for the implementation of the project QA/QC program detailed in the QAPP. Mr. McCracken was also responsible for determining field and laboratory compliance with the QAPP. He was assisted by Mr. Ed Sedlmyer, a chemist, who validated all of the laboratory data.

1.4.6 Contractors

Subcontractors and local, trained labor were selected to perform some elements of the work at the Site. This work included Site preparation (clearing and grubbing), asbestos abatement, demolition of the warehouse, surveying, landscaping, hauling, and disposal. The contractors which performed work during implementation of the IMs are presented in Table 1-1.



REFERENCE:

U.S.G.S. TOPOGRAPHIC MAPS DAMASCUS QUADRANGLE, VA, DATED:1938, PHOTOREVISED:1969, LAUREL BLOOMERY QUADRANGLE, TN–VA, DATED:1938 PHOTOREVISED:1969, SCALE: 1" = 2000'

FIGURE 1–1

BAYER CORP. DAMASCUS, VA	SITE LOCATION MAP	
ICF KAISER ENGINEERS PITTSBURGH, PA	DATE: 5/9/96	DR.: BRENT
	SCALE: 1"=2000'	E/F NO.: 90151001

FIGURE 1-2

PROJECT ORGANIZATION

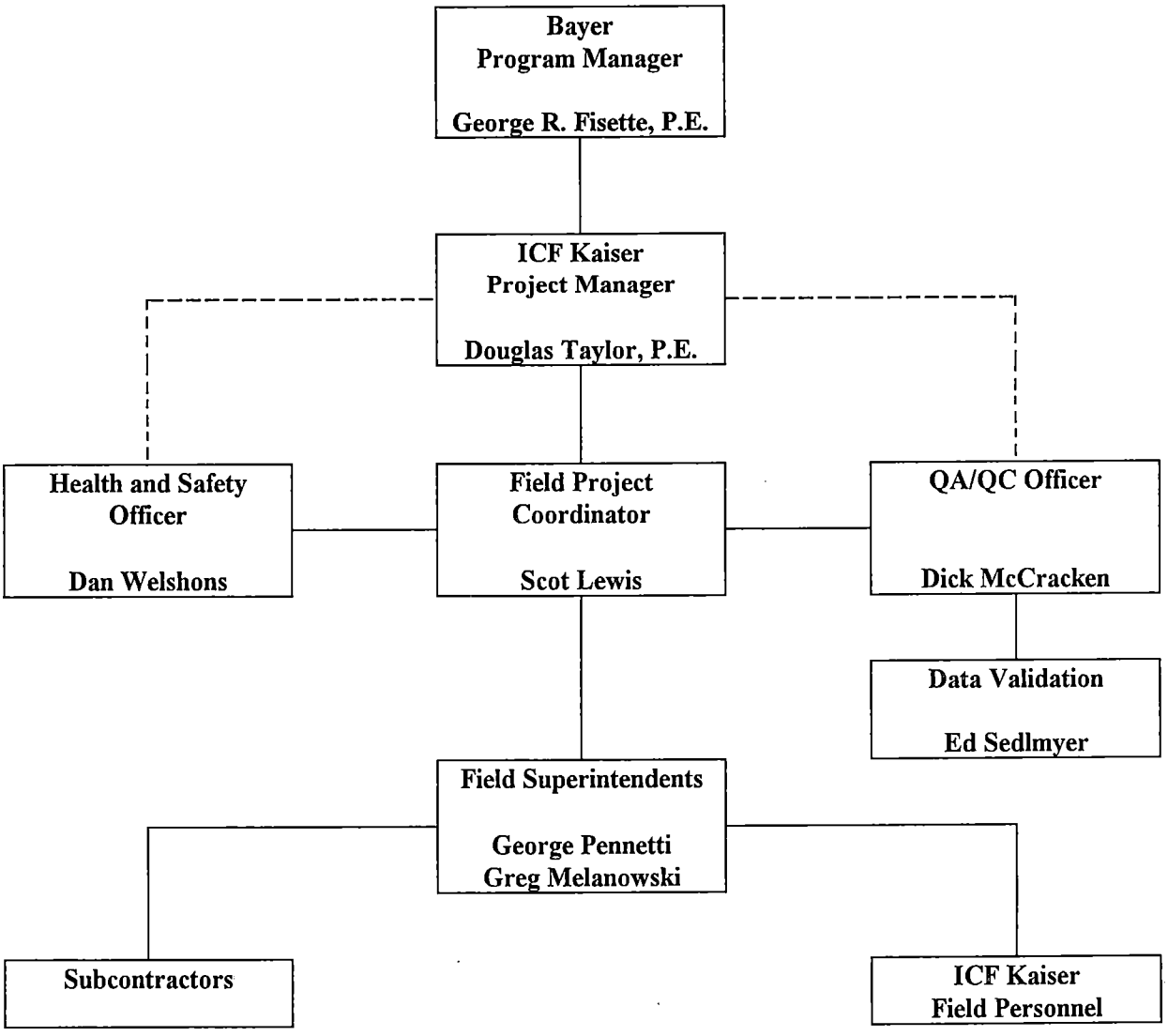


TABLE 1-1

INTERIM MEASURES SUBCONTRACTORS
FTDP FACILITY
DAMASCUS, VIRGINIA

Company	Service
Farmers Construction	Warehouse Demolition
Jones Trucking Company	Transportation of off-site borrow material and non-hazardous waste.
Glen F. Phillips and Company	Surveying
Addison Surveyors	Surveying
E. Luke Greene Company, Inc.	Asbestos Abatement/Disposal (Warehouse)
Iris Glen Landfill	Asbestos Containing Material Disposal Facility
Pools and Spas	Non-hazardous Debris Disposal
BFI Waste Systems, Inc.	Non-hazardous Waste Disposal Facility
Laidlaw Environmental Services, Inc.	Hazardous Waste Disposal Facility
Wills Trucking, Inc.	Transportation of hazardous waste
Quanterra Environmental Services	Laboratory Analytical Services
Bayer Corporation's Environmental Testing Services	Analytical Services
SSM Laboratories, Inc.	Analytical Services (personnel monitors)
Big Valley Seeding	Hydroseeding
Selco Seeding	Hydroseeding
Rio Grande Fence Company	Fence Contractor
Kyte Construction	Transportation of off-site borrow material.

2.0 SCOPE OF WORK

Bayer and the USEPA agreed that completion of the IMs, followed by a Post-IM CMS Report, was the best way to finalize the RCRA Corrective Action process at the FTDP Site. The objectives of the IMs were to 1) reduce the levels of known contaminants on-Site and 2) improve the aesthetic appearance of the Site for future uses. This chapter discusses the tasks conducted at the Site during performance of the IMs. The originally planned scope of work was described in the Final Interim Measures Work Plan (ICF Kaiser, 1996). Changes (mostly additions, some deletions) to the scope of work were implemented due to Site conditions observed during performance of the work that were not known to Bayer during the planning process. These changed conditions were conveyed to USEPA at the time they were discovered and agreement was reached on major scope changes before implementation.

In order to ensure that the USEPA clearly understands Bayer's changes to the scope of work, the tasks originally planned to be performed in accordance with the Final Interim Measures Work Plan (ICF Kaiser, 1996) are referenced as Phase I tasks.

Changes to the Phase I tasks, usually related to expanded removal areas, were required as a result of visual observations made by field personnel or the results of analytic testing. These changes to the original Phase I scope of work are referenced as Phase I_R tasks. For example, additional clearing and grubbing, excavating, sampling, backfilling, etc. in the Flood Debris Landfill, colored soil areas, and lead hot spots are referenced as Phase I_R tasks throughout this document.

Confirmatory sampling conducted in the Southern Non-Process Area around Lead Hot Spots 2, 4, 5, and 6 revealed elevated lead concentrations in surface soils in an area much larger than originally expected. These four lead hot spots are in the vicinity of a former wood processing facility that was located on the Site in the late 1800's and early 1900's.

Bayer decided to conduct comprehensive sampling and excavation actions to identify and remove the soils with elevated lead concentrations in the vicinity of the former wood processing facility. All of the tasks conducted in the vicinity of the former wood processing facility are referenced as Phase II tasks throughout this document.

The elements of the entire scope of work completed during the IMs are included in Table 2-1.

2.1 PHASE I SCOPE OF WORK

Site Preparation: Before beginning any removal actions, the required equipment and personnel were mobilized to perform the Site preparation activities. Site preparation included surveying, clearing and grubbing, construction of erosion and sedimentation controls, construction of temporary haul roads, and collection of pre-removal waste characterization/approval samples.

Flood Debris Landfill: Once the preliminary Site preparation was complete, the removal actions began. Removal of the contents of the Flood Debris Landfill, located in the Southern Non-Process Area, was completed to remove soils shown in samples previously collected to contain significant concentrations of lead. The landfill's sole purpose was for disposal of 1) debris from a former flood event, and 2) sludge and soil from the closure of the former effluent lagoon which occurred in 1977. The effluent lagoon was

reported to be lined with six inches of compacted clay and was capped with clay after the waste materials were placed in it. Removing the contents of the landfill, originally expected to be an area 100′ × 40′, was also conducted to eliminate sociological and aesthetic concerns that could impact any future property transfer.

Small Colored Soil Areas: Two small (10′ x 10′) colored soil areas identified during past investigations were removed during implementation of the IMs. The soil in the colored areas contained blue, purple, black, and other tints used at the former textile dye plant. The presence of these tints has been attributed directly to the former production of textile chemical dyes at the plant. The two small colored areas were removed only to improve the aesthetic appearance and eliminate sociological environmental concerns associated with any future property transfer. No unacceptable lead concentrations existed in the small colored soil areas.

Large Colored Soil Area: The Large Colored Soil Area (LCA) was originally estimated to require a 270′ × 30′ excavation. The LCA also contained soil with blue, purple, black, and other tints. Removal of the LCA was completed to remove soils with elevated lead concentrations and to eliminate sociological and aesthetic concerns.

Lead Hot Spots: Seven surface soil samples collected during the RFI indicated total lead concentrations in excess of the 1,000 mg/kg criteria set for the Site. These seven areas were not associated with any discolored soil or known waste disposal. They were identified as seven lead hot spots for the IM work. Soils in excess of 1,000 mg/kg were removed from these seven hot spots to reduce risks associated with lead to below acceptable levels. Six of the hot spots were located in the Southern Non-Process Area of the Site and one was located in the Northern Process Area. The excavations started with a 10′ × 10′ area centered around the location of the RFI sample.

Confirmatory Sampling: Wherever possible, pre-excavation confirmatory sampling was conducted around the perimeter of all excavation areas. Sampling continued until the lateral limits of the excavation were defined. Then, removal was initiated to a depth of one foot. After the initial excavation, post-excavation sampling was conducted to determine if the bottom of the excavation also met the criteria. Lateral and horizontal removal continued until remaining soils were shown to contain less than 1,000 mg/kg of lead and the 95% upper confidence limit of the arithmetic mean concentration (UCL) was less than 400 mg/kg of lead (Refer to Section 6.0).

Railroad Tie Removal: The locations of three former railroad spurs were evident on the Site. Railroad ties were dug up, removed, and stockpiled on polyethylene sheeting at a staging area located on the Site. Approximately 500 railroad ties were removed.

Warehouse Building Demolition: The former Warehouse Building was the only permanent structure left on the Site. It was removed to avoid interference with soil cover placement in the Northern Process Area and to eliminate concerns about upkeep, trespassing, and vandalism.

Stormwater Management: A number of stormwater management controls included in the original scope of work were completed during the IMs. The controls included restoring existing drainage swales, increasing the capacity of an existing swale by removing an existing culvert and a portion of the Old Plant Road, constructing new drainage swales, restoring existing culverts owned by the State of Virginia, and regrading earthen berms and depressions that could affect surface water runoff.

Northern Process Area Soil Cover: A soil cover was placed over the entire Northern Process Area to promote positive flow of surface waters from the Site. The cover was planned to average one foot in thickness and be constructed with a 1% slope from east to west toward Beaverdam Creek. The original scope of work required construction of a drainage ditch along the eastern and northern exterior perimeters of the Northern Process Area to divert surface water toward the creek.

Numerous other minor tasks were performed as part of the original scope. Permanent vegetation was established after the completion of work in all disturbed areas. Damaged, open, or gated sections of the chain link fencing on the Site were repaired and/or replaced. The concrete decontamination pad (from the RFI) was demolished and disposed. Utility services (water, sewer, power, and phone) were terminated before demobilization of all personnel and equipment from the Site occurred.

Most of the original tasks identified in the Work Plan were completed as planned. Some tasks were not completed, including: 1) construction of the drainage ditch along the east and north of the Northern Process Area, 2) removal of a concrete cistern along Virginia Route 716, and 3) regrading of earthen berms and depressions in the Southern Non-Process Area.

It was determined during performance of the work that the Northern Process Area perimeter drainage ditch was not required due to the revised Erosion and Sediment Control Plan. The concrete cistern was already filled with soil and did not present any physical hazard that required removal of the structure. The earthen berms were not regraded because the only water retained by the berms was a small amount of groundwater, and the berms did not appear to impact surface water drainage.

2.2 PHASE I_R SCOPE OF WORK

During the performance of the work, numerous additional tasks were identified and completed in order to meet the objectives of the IMs established by Bayer. These tasks were referenced as Phase I_R tasks.

Site Preparation: Conditions observed by field personnel or confirmed by sampling results required the original limits of removal at the Flood Debris Landfill, the colored soil areas, and Lead Hot Spots 2, 4, 5, and 6 to be increased significantly. In order to complete the pre-excavation confirmatory sampling, field personnel had to perform additional cleaning and grubbing and install additional erosion and sedimentation controls.

Flood Debris Landfill: The excavation activities at the landfill revealed that the buried contents extended much farther to the north and west than originally suspected. As stated previously, the contents of the landfill were originally expected to occupy an area 100′ x 40′. The final limits of removal were approximately 170′ x 50′. The excavations continued until stained soil or debris were no longer visible. Then, confirmatory samples were collected to verify that lead concentrations in the remaining soils were within the cleanup criteria.

Small Colored Soil Areas: Removal actions at the two small colored soil areas continued until stained soils were no longer visible. Confirmatory sampling was not conducted. The final 220′ x 25′ excavation contained both of the original 10′ x 10′ areas. Removal continued to a maximum depth of four feet.

Large Colored Soil Area: Additional colored soils were observed much farther to the west and south than expected in the original 270′ x 30′ area. Following removal of all observed colored soil from the final

320′ x 90′ excavation, confirmatory sampling was completed to ensure that remaining soils were within the cleanup criteria.

Lead Hot Spots: Lead Hot Spots 1, 3, and 7 were excavated as planned during the Phase I work, because all soils above the cleanup criteria were removed within the 10′ x 10′ excavation. Pre-excavation confirmatory sampling at Lead Hot Spot 6 verified that all soils remaining after the final 16′ x 20′ excavation were within the cleanup criteria. Several intervals of pre-excavation confirmatory sampling at Lead Hot Spots 2, 4, and 5 revealed the extent of lead contamination was much larger than expected. These three hot spots were remediated as part of the Phase II scope of work (Refer to Section 2.3).

Warehouse Building Demolition: Pre-demolition characterization sampling conducted on the Warehouse Building revealed that the roofing was asbestos containing material (ACM). As a result, an asbestos abatement contractor was hired to remove and dispose of all ACM prior to demolition of the rest of the building. At the request of the Mayor of Damascus, Bayer plans to donate the Warehouse Building's 17 steel roof trusses to the City. In order to remove the trusses without causing any damage, a 100-ton crane was mobilized. The trusses are being temporarily staged on the Northern Process Area of the FTDP. A 20′ × 4′ × 4′ subsurface concrete sump, located near the warehouse and extended outside the perimeter fence, was demolished and backfilled. This sump was apparently used to protect water valves that were part of the former plant. The valves and piping outside the fencing were left in place. All concrete and wood debris within the perimeter fence were removed and disposed.

Monitoring Well Abandonment: Twenty-one groundwater monitoring wells installed during the RFI and three temporary piezometers installed during the IMs were abandoned during a remobilization to the Site on February 10-11, 1997.

Bunker Removal: A partially buried bunker was found in the southern portion of the Site and removed. The bunker was constructed from concrete block with a concrete floor and a metal roof.

Stormwater Management: A revised Erosion and Sediment Control Plan required the construction of drainage swales throughout the Northern Process Area. The revised plan required the slope of the Northern Process Area soil cover to fall from south to north as opposed to from east to west, as originally planned. Additional earthwork and sediment control (e.g., straw bales) were completed that were not originally planned.

2.3 PHASE II SCOPE OF WORK

Grid Sampling: During performance of confirmatory sampling around four of the original lead hot spots (2, 4, 5, and 6) in the Southern Non-Process Area, Bayer determined that the extent of soils with elevated lead concentrations was greater than originally anticipated. The source of the unexpected levels and extent of lead is believed to be the former wood processing plant, located in that portion of the Site in the early 1900's. However, no point source or epicenter could be found. Instead of continuing a repetitive and inefficient cycle of digging and sampling, Bayer stopped excavation completely and began an extensive Phase II sampling program around the four lead hot spots and the former concrete foundations associated with the wood processing operations to delineate the extent of contamination. A 600′ × 320′ ft grid with 40′ centers was established to identify sample locations.

Phase II Site Preparation: In order to perform the expanded removal operations, extensive clearing and grubbing was required, since the targeted area was within a densely vegetated portion of the Site. Approximately 700 feet of additional temporary access roads were constructed to remove wastes and approximately 1,000 feet of additional silt fence was installed to control erosion in the work areas.

Phase II Soil Removal: The results of the grid sampling identified numerous locations with elevated lead concentrations that were not previously identified. Bayer consequently decided to implement an expanded removal effort that would satisfy the project objectives. The expanded removal was conducted in accordance with the cleanup criteria that required removal of all soils with total lead concentrations greater than 1,000 mg/kg. Removal also continued until the 95% UCL mean lead concentration was less than 400 mg/kg in each of four quadrants dividing the Southern Non-Process Area of the Site. The concrete foundation rubble from the former wood processing facility was removed as part of this expanded scope of work.

Piezometer Installation: In response to a request made by the USEPA, three temporary piezometers were installed in the Southern Non-Process Area to confirm groundwater flow in the vicinity of the former wood processing facility area.

TABLE 2-1

SCOPE OF WORK TASKS
FTDP FACILITY
DAMASCUS, VIRGINIA

Task	Phase I	Phase I_R	Phase II
Mobilization	✓		
Removal Area and Property Boundary Surveying	✓		
Silt Fence/Straw Bale Installation	✓		
Additional Silt Fence/Straw Bale Installation		✓	✓
Clearing and Grubbing	✓		
Additional Clearing/Grubbing		✓	✓
Pre-Removal Waste Characterization Sampling	✓		
Additional Waste Characterization Sampling			✓
Asbestos Sampling	✓		
Borrow Pit Sampling	✓		
Access Road Construction	✓		
Additional Access Road Construction			✓
Phase I Lead Hot Spot Removal/Backfill	✓		
Small Colored Soil Removal/Backfill	✓		
Expanded Small Colored Soil Area Removal		✓	
Large Colored Soil Removal/Backfill	✓		
Expanded Large Colored Soil Area Removal		✓	
Flood Debris Landfill Contents Removal/ Backfill	✓		
Expanded Flood Debris Landfill Contents Removals		✓	
Confirmatory Sampling	✓		
Additional Confirmatory Sampling		✓	✓
Railroad Tie Removal	✓		
Expanded Railroad Tie Removal			✓
Cistern Removal	✓		
Warehouse Building Asbestos Removal		✓	
Warehouse Building Steel Truss Removal/Salvage		✓	
Warehouse Building Water Supply Sump Removal/Backfill		✓	
Warehouse Demolition	✓		
Bunker Demolition		✓	
Northern Process Area Soil Cover Construction	✓		
Northern Process Area Topographic Surveying		✓	
Revised Northern Process Area Soil Cover Placement		✓	
Northern Process Area Drainage Swale Construction		✓	
Off-Site Culvert Cleanout	✓		

TABLE 2-1 (Continued)

SCOPE OF WORK TASKS
FTDP FACILITY
DAMASCUS, VIRGINIA

Task	Phase I	Phase I_R	Phase II
On-Site Culvert/Plant Road Removal	✓		
Existing On-Site Drainage Swale Restoration	✓		
New On-Site Drainage Swale Construction	✓		
New Off-Site Drainage Swale Construction	✓		
Eastern Berm Grading	✓		
Grid Sampling Implementation			✓
Wood Processing Facility Concrete Foundation Rubble Removal/Backfill			✓
Phase II Soil Removal/Backfill			✓
Piezometer Installation			✓
Decontamination Pad Removal	✓		
Waste Disposal	✓		
Additional Waste Disposal			✓
Site Perimeter Fence Repair	✓		
Permanent Vegetation Establishment	✓		
Additional Permanent Vegetation Establishment		✓	✓
Utilities Termination	✓		
Site Trailer Removal/Disposal	✓		
Monitoring Well Abandonment		✓	
Demobilization	✓		

NP = Not Performed

3.0 HEALTH AND SAFETY

The health and safety of workers and the community were paramount through the course of activities required to complete the IMs. Accordingly, a strict health and safety program was developed and implemented. The procedures and practices utilized to minimize the probability of worker injury or chemical exposure were established and presented in the Site-specific Health and Safety Plan (HASP) (ICF Kaiser, 1996) developed for the Site. This section provides a brief summary of the health and safety procedures employed during performance of the IMs.

3.1 SITE HEALTH AND SAFETY OFFICER (SHSO)

A designated SHSO was on-Site throughout the work. The SHSO enforced the policies and provisions contained in the plans, served as a liaison to project management personnel, and conducted safety briefings and Site orientations for all workers and visitors.

3.2 VISITORS

Unauthorized visitors were not permitted within established work Site control zones. Authorized visitors were required to read and sign the HASP. Visitors were provided an initial health and safety briefing and Site orientation by the SHSO.

3.3 SITE ENTRY AND EXIT

All personnel were required to sign-in each day at the designated point of entry, the construction trailer, and proceed to their designated work areas only. All personnel had to sign-out prior to leaving the Site each day.

3.4 DAILY START-UP PROCEDURES

Each day prior to initiating IM tasks, the SHSO conducted a health and safety briefing. This briefing, at a minimum, reviewed existing Site conditions and hazards, and reviewed safety requirements for the day's tasks to be performed. All safety and monitoring equipment were checked to ensure proper operation prior to initiating work activities. The start-up activities along with the proposed days activity, weather conditions, monitoring readings, and any other health and safety issues were documented in a logbook designated only for health and safety.

3.5 TRAINING REQUIREMENTS

All personnel that performed hazardous material field tasks (as identified in the HASP) received 40-hours of initial off-Site hazardous training prior to on-Site Work. All 40-hour trained workers were also required to have received an annual 8-hour hazardous material refresher course. Managers and supervisors possessed an additional 8 hours of specialized off-Site training in their supervisory responsibilities.

At least one person currently certified in basic first aid and CPR was present on the Site at all times.

All workers who performed asbestos abatement on the Warehouse building met the training requirements necessary to perform such work in the State of Virginia.

Some work was performed on the Site by personnel who did not possess hazardous materials training. Non-trained workers were only utilized to cut overgrown vegetation in the Northern Process Area. This was accomplished only after the removal activities at Lead Hot Spot 1 were completed. The crew utilized to perform this work was obtained through a local job service on a temporary basis. The temporary crew was supervised by hazardous materials trained personnel and were not permitted at any time to enter defined work zones.

Many of the truck drivers that were contracted to haul wastes from the Site did not have any formal off-Site hazardous material training. However, all trucks were required to park at spots on the designated access roads adjacent to removal areas during waste loading operations. The truck drivers were not permitted to leave the cab of their truck at any time while they were on-Site, and the trucks did not leave the gravel roads, so no Site soil was spread off-Site.

3.6 MEDICAL MONITORING

All personnel that participated in hazardous material activities had medical examinations prior to participation in on-Site operations, and either at the conclusion of the work, or at 12-month intervals during their normal employment monitoring.

3.7 WORK ZONES

The primary means of maintaining Site control and reducing migration of hazardous materials into uncontaminated areas was by designating work zones. Work zones serve to limit hazardous area access, contain gross contamination, provide work zone security, and place a buffer zone between the potentially hazardous areas and the rest of the Site. The following work zones were established for each hazardous material task of the project.

- Exclusion Zone
- Contamination Reduction Zone
- Support Zone.

The exclusion zones include those hot spots which were considered lead contaminated, potentially contaminated, or could become contaminated during Site activity. The contaminated areas were defined using flagging to ensure inadvertent entry did not occur. While the delineation of exclusion zones was completed prior to initiating Site work, the zones were increased or decreased during the course of the project as new data was collected and evaluated. Entering and leaving an exclusion zone was controlled by the SHSO.

The contamination reduction zones were located upwind of the exclusion zones, when possible, and were designed to limit contamination from leaving the work zone as a result of the work party activities. Access

control points to both the exclusion zone and any support zones were maintained here. This area provided a space for the decontamination of personnel, equipment, and samples, and an area to assist the work parties (respirator cartridge exchange, equipment staging). This work zone was established in an area assumed to be clean, but considered potentially contaminated as soon as personnel or equipment are processed from the exclusion zone through decontamination. The boundary area between the exclusion zone and contamination reduction zone was referred to as the "hot line." Hot lines were established approximately 25 feet away from the entire perimeter of identified exclusion zones. It was here that a decontamination corridor was set up to ensure the decontamination of all personnel, equipment and samples leaving the exclusion zone. The other boundary, between the contamination zone and the support zone, was known as the contamination control line. It served as the entrance/exit point to the work zone and provided the Site security as well as contamination control. The perimeter fence around the Southern Non-Process Area served as the contamination control line.

The support zone was the area furthest away from the hazardous substances. It is where the command post was located and all support activities occurred. Project health and safety equipment was stored in the support zone and available for use. Sanitation facilities such as a toilet, wash facilities and potable drinking water were available to Site workers in this area. This zone was located in a known, non-contaminated section of the Northern Process Area.

Personnel involved in hazardous material project activities satisfied the following requirements consistent with 29 CFR 1910.120 and 1926.65 before initiating work within the exclusion zones:

- Received and passed a physical examination, including certification of ability to wear respiratory protection and current fit-test.
- Received required training in the occupational safety and health aspects of hazardous material Site operations.
- Received a briefing on all aspects of the Site health and safety plan. All on-Site briefings were documented in the field log books.

Personnel entering the contamination reduction zone and the exclusion zone through the contamination control line were dressed in the specified level of protection for the specific task. Similarly, all personnel, equipment, and samples exiting to the support zone completed decontamination prior to crossing the contamination control line.

At the conclusion of the hazardous material hot spot removal activities, work zone demarcations were modified. The fenced areas of the Site were considered the primary work area. This area was controlled to allow entry by personnel necessary to complete the scope of work. When warranted at the discretion of the SHSO (during warehouse demolition), warning devices such as flagging, traffic cones, or other devices were used to deter personnel from approaching a potentially dangerous work area.

3.8 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Safeguards against dermal and/or inhalation hazards that could have been encountered were provided by the appropriate levels of PPE. The PPE requirements for each task were defined in the HASP and strictly followed throughout the project.

3.9 AIR MONITORING

Baseline air monitoring was conducted prior to initiating intrusive activities at each removal area. This air monitoring was performed to confirm the initial level of protection for Site workers.

An aerosol monitor was utilized to monitor the breathing zone of Site workers during lead contaminated soils removal or handling activities. Action levels were established and identified in the HASP. Readings were recorded at 30 minute intervals and documented in the Air Monitoring Log. The Air Monitoring Log is currently on file at ICF Kaiser's offices in Pittsburgh, Pennsylvania. No readings that required actions to upgrade to higher levels of protection were observed throughout the work handling lead contaminated soils.

3.10 DECONTAMINATION PROCEDURES

Decontamination procedures were established for the purpose of removing gross contamination that may have accumulated on workers during hazardous material handling activities and to prevent possible contaminants from migrating off-Site. Additional procedures for the decontamination of sampling equipment, hand tools, and heavy equipment were implemented in accordance with the requirements of the Field Sampling/Waste Management Plan.

Decontamination activities for sampling equipment were conducted within the limits of the contamination reduction zone. Hand tools and other sampling equipment (shovels, stainless steel bowls, hand trowels, etc.) were decontaminated using tap water and detergent, rinsed with a 10% nitric acid solution followed by a rinse with deionized water. The liquid and sediment waste generated from decontamination of hand tools and sampling equipment were containerized in four 55-gallon steel drums. The drums were staged on the decontamination pad in the Northern Process Area. The decontamination pad was constructed from concrete with a berm around the perimeter to contain any potential spills. The perimeter of the decontamination pad was secured with four-foot high orange fencing in order to prevent accidental exposure to contaminated media. Personal protective equipment (PPE) was discarded and placed in bags prior to exiting the contamination reduction zone. The bags were sealed and identified as containing PPE, and staged on the decontamination pad.

Heavy equipment was decontaminated using dry methods. Solids built up on the exterior of heavy equipment were meticulously removed by manual methods using picks, hand trowels, brushes, and other sharp objects. Decontamination activities were performed on a temporary containment pad. The removed solids were containerized and staged on the decontamination pad.

4.0 FIELD ACTIVITIES

This chapter describes, in detail, all of the activities that were completed at the Site. The Interim Measures field work at the FTDP in Damascus, Virginia began on June 4, 1996 and was completed on November 25, 1996 (Refer to Section 8.0 for a discussion on miscellaneous work remaining following demobilization). Mobilization, subcontracting and planning began in May prior to the beginning of Site activities. Table 4-1 provides a timetable of the tasks performed during the IMs.

4.1 SITE PREPARATION ACTIVITIES

Site preparation activities involved clearing and grubbing excavation areas and roadway corridors, constructing gravel haul roads that provided heavy equipment access to the removal areas, installing erosion and sedimentation control throughout the Site in order to manage stormwater, and surveying both the Site property boundary and the limits of the specific removal areas. Prior to beginning Site preparation activities, Virginia One-Call was notified of potential construction activities in the area surrounding the Site. They identified and marked all known active and inactive utility lines in the work areas.

During Site preparation activities and throughout performance of the IMs, the Erosion and Sediment Control Plan (ICF Kaiser, 1996c) was implemented. This plan was prepared in accordance with the *Virginia Erosion and Sediment Control Handbook (Virginia Department of Conservation and Recreation,* 1992). Prior to mobilization, the Erosion and Sediment Control Plan was submitted to the Washington County, Virginia Building Inspector. The Erosion and Sediment Control Plan was also submitted to Mike Overstreet of the Virginia Department of Environmental Quality (VADEQ) in Abingdon, Virginia as part of the application for a Virginia Pollutant Discharge Elimination System (VPDES) General Permit Registration Statement for Stormwater Discharge from Construction Sites. The VADEQ assigned Permit No. VAR 410081. A VPDES General Permit Notice of Termination for Stormwater Discharges from Construction Sites was submitted following demobilization in November 1996.

A Stormwater Pollution Prevention Plan (SWPP) dated May 30, 1996 (ICF Kaiser, 1996g) was submitted to the VADEQ in accordance with VPDES requirements. This submittal did not require acceptance or approval.

A zoning application was submitted to the City of Damascus prior to beginning the construction of the soil cover in the Northern Process Area. The application was submitted to the City of Damascus Planning Commission in care of the Mount Rogers Planning Council on July 8, 1996 because the soil cover was constructed in a flood plain fringe. The Mount Rogers Planning Council provides engineering and planning services to the City of Damascus. The application was discussed and approved at the City of Damascus Planning Commission meeting on July 17, 1996.

The scope of the IMs work expanded because of data gathered during performance of the work. The scope change resulted in larger removal areas to complete the IMs objectives. The Original Limits of Excavation and the Final Limits of Removal Areas are depicted in Figures 4-1 and 4-2, respectively.

4.1.1 Clearing and Grubbing

Most of the heavier clearing and grubbing took place in the densely wooded Wood Processing Facility Area. The majority of the clearing and grubbing activity was required for the Flood Debris Landfill, the Large Colored Soil Area (LCA), the Phase II Removal Area, and the temporary construction entrance and access roads within the non-process area. The areas which required clearing and grubbing are depicted on Figure 4-2. The construction entrance was located at the Site gate along Virginia Route 716 across from Textile Street. This entrance included an area large enough for waste haulers to turn their vehicles around if necessary.

Access roads to haul wastes from the LCA, the Flood Debris Landfill, and the Phase II Removal Area (which contained Phase I Lead Hot Spots 2, 4, 5, and 6) required significant removal of trees and brush. Approximately 1,200 feet of roadway was cleared using chain saws and miscellaneous hand tools. All clearing and grubbing was accomplished in such a way as to minimize disturbance and retain as much of the existing vegetation as possible. All brush and vegetation was shredded with a power chipper. The wood chips were spread along access roads to assist dust suppression and reduce mud during periods of rain.

Several dirt access roads existed on the Site prior to implementation of the IMs. These roads were constructed to provide access for drill rigs for installation of groundwater monitoring wells during a previous investigation. The dirt roads were easily reclaimed for the IMs by removing small bushes and limbs that had grown over since road construction.

4.1.2 Work Area Surveying and Identification

During Site preparation activities, the locations of the original seven soil hot spots, and the limits of the colored soil areas and the Flood Debris Landfill were surveyed and staked by a Virginia licensed firm, Glen F. Phillips, and Company. The basis for this work was the analytical results and corresponding survey data included in the Final RFI Report (ICF Kaiser, 1996f). Many of the survey stakes placed during the RFI were found still in place. The limits of the colored soil areas and the Flood Debris Landfill were determined from historical information and visual observations noted during the previous surveying activities.

All surveyed points were marked and identified with painted wooden stakes. A 10-foot square with the hot spot in the center was delineated at each of the seven hot spots. In order to provide a safe environmental for all persons on-Site, each of the removal areas was cordoned off with bright yellow or orange caution tape. The removal areas remained cordoned off until waste removal was complete.

4.1.3 Haul Road Construction

In order to support the truck traffic required to haul the wastes from the landfill, LCA and the lead hot spots, a series of gravel haul roads were constructed in the Southern Non-Process Area, with access through the construction entrance. Most of the approximately 1,200 feet of road was constructed without the need for excavation or installation of a subbase. However, because of wet soils, a 300-foot portion of the haul road near the LCA required the installation of subbase constructed from compacted borrow material.

The roads installed without a subbase were constructed by installing a medium weight geotextile fabric, AMOCO 2002, directly on top of the previously cleared and grubbed surfaces. Then a running surface of American Association of State Highway and Transportation Officials (AASHTO) No. 57 stone was placed over the fabric. The construction entrance was also constructed in this manner.

The 300-foot portion of haul road near the LCA required approximately 300 cubic yards of off-Site borrow material to be placed and compacted before installation of a heavyweight geotextile fabric. Two samples of the borrow material (Samples BD-BA-005 and BD-BA-006) were collected from the borrow site, prior to hauling, in order to ensure that the material was not contaminated. The samples were sent to Bayer's Environmental Testing Services facility in New Martinsville, West Virginia. The results of the laboratory analysis conducted on samples from the borrow material are included in Appendix A (Damascus Fill Soil - June 13, 1996). Following placement of the borrow material, the heavier geotextile fabric, AMOCO 2016 was installed. Then a running surface of AASHTO No. 57 stone was spread out over the fabric.

Waste removal activities at the two small colored soil areas and Lead Hot Spots 1, 3, and 7 did not require the construction of haul roads. The existing dirt roads were cleared to permit access by a backhoe and a small bucket loader. The soil from these areas was excavated by a backhoe and placed directly into one cubic yard capacity supersack containers that were secured to fork attachments on the small bucket loader. The locations of the new gravel and reclaimed dirt roads on the Site are included on many of the drawings included in this report but are best depicted on Figure 4-2.

4.1.4 Erosion and Sedimentation Controls

The Site is flat with intermittent ditches to direct surface water westward to Beaverdam Creek. In order to prevent erosion during IM construction activities and improve future stormwater drainage from the Site, a number of controls were implemented as part of the IMs. These controls are illustrated on Figures B-1 and B-2 in Appendix B. The need for these improvements was determined after evaluating the hydrologic data obtained during the RFI (ICF Kaiser, 1996f). These improvements were described in the Final Interim Measures Work Plan (ICF Kaiser, 1996) and the Erosion and Sediment Control Plans (ICF Kaiser, 1996c) which were submitted to the USEPA.

Erosion control measures were implemented wherever IMs work would be detrimental to the stormwater drainage patterns or could cause sedimentation problems. These areas included all work adjacent to Beaverdam Creek, the eastern boundary of the Northern Process Area adjacent to Virginia Route 716, downgradient of all excavations, and the drainage ditch and culvert beneath the Old Plant Road.

Erosion control measures which were implemented during the IMs included the placement of silt fence barriers along the downgradient perimeter of all excavations, tree preservation and protection during clearing, grubbing and removal operations (trees in excess of 9" in diameter were not removed), sowing native grasses in swales and stormwater conveyance channels, and establishing permanent vegetative stand immediately after backfilling removal areas.

Sediment control measures implemented during the IMs included placement of straw bale barriers in drainage swales until all activity was completed and permanent vegetation was established, placement of wood chips generated from clearing and grubbing onto dirt access roads, and installation of the gravel construction entrance and haul road for trucks to minimize dust and eliminate contact between haul trucks and dirt roads at the Site.

4.1.5 Stormwater Management Controls

Several stormwater drainage improvements were completed during the course of the work. These controls included the placement of a soil cover in the Northern Process Area to carry sheet flow to Beaverdam Creek, restoration of existing drainage swales, and construction of new drainage swales. The soil cover in the Northern Process Area was placed at 1% grade to minimize runoff erosion.

Two activities were included in the Final Interim Measures Work Plan but were not conducted. First, two earthen berms in the non-process area were to have been filled and graded to provide positive drainage. The rationale for this action was that water in the depressions was thought to have been stormwater. It was determined in the field that the water was actually groundwater. Therefore, no action was necessary to upgrade stormwater drainage. It was also determined in the field that no action was required to improve stormwater drainage along the eastern boundary of the soil cover in the Northern Process Area. Accordingly, no swales or rock check dams were constructed in this area of the Site.

4.2 PHASE I AND PHASE I_R REMEDIAL ACTIVITIES

During the performance of the IMs included in the original scope of work, several remedial efforts were implemented and completed to reduce the levels of known contaminants on-Site and improve the aesthetic appearance for future use. This section describes each area remediated, the methods used, the sampling activities conducted, and the wastes disposed during the IMs implementation.

In accordance with 29 CFR 1926.62 (lead in construction), industrial hygiene air samples were collected and analyzed for total lead during removal activities. The initial sampling event was performed on June 18, 1996, during excavation of the Phase I Lead Hot Spots and additional intrusive activity resulting from silt fence installation. The second sampling event was performed on September 26, 1996 during lead contaminated soil removal activities in the Phase II Soil Removal Area. This second sampling event was conducted to verify that the higher concentrations found during Phase II sampling did not present a hazard to Site workers due to a change in Site conditions since the initial exposure assessment was completed.

The breathing zone industrial hygiene air samples collected were representative of the exposure to Site workers in each job classification. The full-shift air samples were collected using a personal sampling pump and an in-line mixed cellulose ester filter cassette. The samples were analyzed for total lead by SSM Laboratories, Inc., located in Reading, Pennsylvania, which is accredited by the American Industrial Hygiene Association. The results for both sampling events confirmed that exposures to the Site workers did not exceed the action level of 0.03 mg/m^3, as presented in 29 CFR 1926.62. The air sampling results for the two sampling episodes can be found in Table 4-2.

4.2.1 Flood Debris Landfill

The specific contents of the Flood Debris Landfill were unknown before implementation of the IMs. Past investigations, however, showed that surface soils in the landfill contained elevated lead concentrations. During the RFI, blue material was also discovered in a test pit within the landfill boundaries. Before implementation of the IMs, the landfill was originally thought to occupy an area 40′ x 100′, and was estimated to contain material 6′ deep. During the IMs, the landfill was found to contain soils stained with black and blue dyes and miscellaneous wood and metallic debris. The Phase I_R final limits of the Flood Debris Landfill excavation were 50′ x 170′, with an average depth of 4 feet, as depicted on Figure 4-3.

Removal of the landfill contents continued until three criteria were met. First, removal continued until visual observations confirmed that no further waste material remained buried. Second, since the previous investigation revealed elevated lead concentrations in surface soils, removal of the contents of the landfill also continued until perimeter and base confirmatory sampling indicated remaining soils contained less than 1,000 mg/kg of lead. Third, the area average of lead concentrations in all remaining soils at the 95% upper confidence level (UCL) of the arithmetic mean was less than 400 mg/kg.

Waste Characterization

The Flood Debris Landfill was sampled prior to initiating removal activities. Six representative grab samples were collected at spatially distributed intervals approximately two feet below the ground surface and were composited into one sample (BD-IM-039) for Full TCLP analysis by Bayer. The sample results are presented in Appendix A (Damascus Soil Samples Characterization - July 19, 1996). Based on the sample results and written approval from the State of Tennessee, Department of Environment and Conservation, Division of Solid Waste Management, the material from the Flood Debris Landfill was classified as non-hazardous waste.

Removal Activities

Gravel roads were constructed on the north and east sides of the landfill to provide access for dump trucks that were used to haul the removed wastes. The non-hazardous wastes were loaded by trackhoe directly into the trucks. Approximately 2325 tons of non-hazardous wastes from the Flood Debris Landfill were removed and disposed at BFI's Carter Valley Landfill in Church Hill, Tennessee (BFI).

Confirmatory Sampling

Following excavation of the contents of the Flood Debris Landfill, a 2' buffer zone was tilled on the four perimeter sides of the excavated area. Seven confirmatory samples were collected from the surface soils within the two foot buffer zone. The bottom of the excavation was tilled to a depth of 6" and eight base samples were collected. These samples were submitted to either the Bayer Laboratory in New Martinsville, West Virginia or Quanterra Laboratory in Knoxville, Tennessee. Samples were collected in accordance with the Field Sampling/Waste Management Plan (FS/WMP) (ICF Kaiser, 1996b) and the Quality Assurance Project Plan (QAPP) (ICF Kaiser, 1996e) prepared by ICF Kaiser.

The confirmatory sampling was completed after excavation in the Flood Debris Landfill removed all visual landfilled materials and stained materials. None of the 15 samples collected contained lead concentrations above the clean-up criteria of 1000 mg/kg of lead. A summary is included in Table 4-3. The results of the confirmatory sampling in the Flood Debris Landfill are illustrated on Figure 4-3.

The Flood Debris Landfill was backfilled with off-Site borrow material obtained from a source which was analyzed and found to be free of contamination. The backfill was compacted until non-movement of the fill was observed beneath the heavy equipment used to perform the work. The finish surfaces were smooth graded without irregular surface transitions.

4.2.2 Large Colored Soil Area

Based on RFI observations, the Large Colored Soil Area (LCA) was originally estimated, during Phase I, to require a 270′ x 30′ excavation. During the IMs, removal continued until no visible colored soils or debris remained. The debris consisted of steel drum fragments, wood, and miscellaneous metallic debris. Since surface soils in the LCA were previously shown to contain elevated lead concentrations, confirmatory sampling was employed at both the perimeter and the base of the excavation to ensure the remaining soils met the cleanup criteria. The final LCA excavation was larger than originally estimated because colored soil and debris extended further south and west than expected. The Phase I_R final LCA excavation, depicted on Figure 4-4, was approximately 320′ x 90′.

Waste Characterization

Twenty grab samples at spatially distributed intervals were collected from the 270′ x 30′ Large Colored Soil Area from a depth of 0 - 12" below ground surface. The grab samples were composited into one sample (BD-IM-064) for full TCLP analysis at Bayer's laboratory. The results are included in Appendix A (Damascus Soil Samples Characterization - July 19, 1996). Based on the results of this composite sample and written approval from the State of Tennessee, the soil in the Large Colored Soil Area was classified as non-hazardous waste.

Removal Activities

Excavation in the Large Colored Soil Area (LCA) continued until all soils with visible staining were removed. Gravel access roads were constructed on the south and west sides of the LCA to be used by the dump trucks that hauled the removed waste. The 4,022 tons of non-hazardous waste from the LCA were loaded directly into the trucks by a trackhoe and then transported to BFI's Carter Valley Landfill for disposal.

Confirmatory Sampling

After the removal was complete, confirmatory sampling was performed in the Large Colored Soil Area following the same procedures as described for the Flood Debris Landfill. The results of the 35 samples analyzed are summarized in Table 4-4. The results of the confirmatory sampling in the LCA are illustrated on Figure 4-4.

The Large Colored Soil Area was backfilled with off-Site borrow material obtained from a source which was analyzed and found to be free of contamination. The backfill was compacted until non-movement of the fill was observed beneath the heavy equipment used to perform the work. The finish surfaces were smooth graded without irregular surface transitions.

4.2.3 Small Colored Soil Areas

Two small (10′ x 10′) areas, previously observed to contain colored soil, were remediated to improve the aesthetic appearance of the Site. Removal in these two small areas continued until all visible colored soil was removed. During Phase I_R work activities, both the horizontal and vertical extent of the two small colored areas increased. The Phase I_R final limits of excavation consisted of a 25′ x 220′ area, as depicted on Figure 4-5.

Waste Characterization

Six grab samples at spatially distributed intervals were collected from each of the two 10′ × 10′ colored areas from a depth of 0 - 12" below ground surface. These samples were composited into one sample (BD-IM-065) for full TCLP analysis at Bayer's laboratory. The sample results are presented in Appendix A (Damascus Soil Samples Characterization - July 19, 1996). Based on the result and written approval from the State of Tennessee, the soils from the Small Colored Soil Areas were characterized as non-hazardous waste.

Removal Activities

Material removal at the two small colored soil areas was completed using a backhoe and a small bucket loader. The wastes were removed with the backhoe and loaded directly into nylon supersack containers. The supersacks are a 3′ x 3′ x 40″ heavy, woven polyester bag with a nylon web loop at each corner for holding and loading. The small bucket loader was used to support and hold open the supersacks.

Colored soils were identified to a depth of 4′. Figure 4-5 illustrates both the Phase I and Phase I_R final limits of removal at the two small colored soil areas. Fifty-eight (58) supersack containers of non-hazardous soils were removed from the two areas. These wastes were transported to a secure staging area on the Site and disposed at BFI's Carter Valley Landfill along with the non-hazardous soils from Lead Hot Spots 1, 3, 6, and 7 (Refer to Section 4.2.4).

Confirmatory Sampling

No confirmatory samples were collected at the small colored soil areas since lead was not a constituent of concern. Analysis of the soil samples collected during previous investigations from the two Small Colored Soil Areas did not reveal elevated lead concentrations. Because there were not elevated lead concentrations associated with these areas, no confirmatory sampling was performed during the IMs. The limits of excavation for these areas was based on visual observation of colored soils.

The Small Colored Soil Areas were backfilled with off-Site borrow material obtained from a source which was analyzed and found to be free of contamination. The backfill was compacted until non-movement of the fill was observed beneath the heavy equipment used to perform the work. The finish surfaces were smooth graded without irregular surface transitions.

4.2.4 Lead Hot Spots

Seven hot spots, with elevated lead concentrations that were identified during the RFI surface soil sampling, were targeted for removal during completion of the IMs. Six of the hot spots were located in the Southern Non-Process Area and one hot spot was located in the Northern Process Area as indicated on Figure 4-1. Each of the seven hot spots was originally planned to be a 10' x 10' area with the RFI sample location in the center.

Silt fence was installed downgradient of each hot spot removal area prior to excavation activities, to prevent potential surface water runoff. Pre-removal waste characterization was conducted prior to excavation of the seven hot spots. Six grab samples at spatially distributed intervals were collected from each hot spot from a depth of 0 - 12" below ground surface. The 42 grab samples from all of the seven

lead hot spots were composited into one sample (BD-IM-008) and were submitted to Bayer's laboratory in New Martinsville, West Virginia. The composite sample was analyzed for total semi-volatile organic compounds and extractable cyanide plus organics and metals followed as preparation by the Toxicity Characteristic Leaching Procedure (full TCLP). Based on the results and written approval from the State of Tennessee, the soil removed from all seven of the 10′ x 10′ Lead Hot Spots was determined to be non-hazardous and was permitted to be disposed of accordingly. The results of the waste characterization sampling from the seven Lead Hot Spots are included in Appendix A (Damascus Soil Samples Characterization - July 19, 1996).

Lead Hot Spot 1

Lead Hot Spot 1 was located in the Northern Process Area. Prior to beginning removal actions, a two foot buffer zone was tilled on the four perimeter sides of the 10′ x 10′ area. Tilling involved using a small backhoe to loosen, mix, and homogenize the soils to an approximate depth of one foot. One composite confirmatory sample was collected from the tilled surface soils within the two foot buffer zone on each side of the excavation. Each composite sample included soil from a minimum of four grab locations. The number of grab locations used for each composite increased for longer buffer zones. The four composite confirmatory samples were submitted to Bayer's laboratory for total lead analysis. Once the analytical results from the first intervals around Lead Hot Spot 1 were reviewed and verified to be less than the cleanup criteria, the soil in the 10′ x 10′ area was removed to a depth of one foot and placed in 1-cubic yard supersacks. The supersacks containing the excavated soils were transported and staged at a secure location on the decontamination pad in the Northern Process Area.

Following excavation of Lead Hot Spot 1, the 100 ft^2 bottom of the excavation was tilled to a depth of six inches and a base composite confirmatory sample was collected. Each composite base sample included soil from five grab locations (one at each corner and one in the center). The removal actions of Lead Hot Spot 1 were terminated because the base confirmatory sample's lead concentration was less than the cleanup criteria. Figure 4-6 illustrates the final limits of removal and the perimeter and base confirmatory sample results. The confirmatory sample results are also summarized on Table 4-5.

Lead Hot Spot 1 was backfilled with off-Site borrow material obtained from a source which was analyzed and found to be free of contamination. The backfill was compacted until non-movement of the fill was observed beneath the heavy equipment used to perform the work. The finish surfaces were smooth graded without irregular surface transitions.

Lead Hot Spot 2

Tilling and horizontal confirmatory sampling continued for many intervals at Lead Hot Spot 2, as depicted on Figure 4-7. Several confirmatory sampling locations on the perimeter of Lead Hot Spot 2 exceeded the cleanup criteria of 1,000 mg/kg total lead dry weight concentration. The confirmatory sample results are summarized on Table 4-6. Due to the inability to reasonably define the outer limits of this hot spot, all Phase I and Phase I_R work was halted. Lead Hot Spot 2 was remediated at a later date as part of the Phase II scope of work. Refer to Section 4.3, Phase II Remedial Activities, for a description of the removal actions and related confirmation sampling.

Lead Hot Spot 3

Lead Hot Spot 3 required only one interval of confirmatory sampling to delineate a horizontal boundary of surface soil whose lead concentration was lower than the cleanup criteria. Prior to beginning removal actions, a two foot buffer zone was tilled to an approximate depth of one foot on the four perimeter sides of the 10′ x 10′ area. One confirmatory sample was collected from the tilled surface soils within the two foot buffer zone on each side of the excavation. The four confirmatory samples were submitted to Bayer's laboratory for total lead analysis. Once the analytical results from the first intervals around Lead Hot Spot 3 were reviewed and verified to be less than the cleanup criteria, the soil in the 10′ × 10′ area was removed to an approximate depth of one foot and placed in 1-cubic yard supersacks. The supersacks containing the excavated soils were transported and staged at a secure location on the decontamination pad in the Northern Process Area.

Following excavation of Lead Hot Spot 3, the 100 ft^2 bottom of the excavation was tilled to a depth of six inches, and a base confirmatory sample was collected, and submitted to Bayer's laboratory for total lead analysis. The removal actions at Lead Hot Spot 3 were terminated because the lead concentration of the base confirmatory sample was less than the cleanup criteria. Figure 4-8 illustrates the Phase I final limits of removal and the perimeter and base confirmatory sample results. The results of confirmatory sampling at Lead Hot Spot 3 are summarized on Table 4-7.

Lead Hot Spot 3 was backfilled with off-Site borrow material obtained from a source which was analyzed and found to be free of contamination. The backfill was compacted until non-movement of the fill was observed beneath the heavy equipment used to perform the work. The finish surfaces were smooth graded without irregular surface transitions.

Lead Hot Spot 4

Tilling and horizontal confirmatory sampling continued for many intervals at Lead Hot Spot 4, as depicted on Figure 4-9. Several confirmatory sampling locations on the perimeter of Lead Hot Spot 4 exceeded the cleanup criteria of 1,000 mg/kg total lead dry weight concentration. The results of confirmatory sampling of Lead Hot Spot 4 are summarized on Table 4-8. Due to the inability to reasonably define the outer limits of this hot spot, all Phase I and Phase I_R work was halted. Lead Hot Spot 4 was remediated at a later date as part of the Phase II scope of work. Refer to Section 4.3, Phase II Remedial Activities, for a description of the removal actions and related confirmatory sampling.

Lead Hot Spot 5

Tilling and horizontal confirmatory sampling continued for many intervals at Lead Hot Spots 5 as illustrated on Figure 4-10. Several confirmatory sampling locations on the perimeter of Lead Hot Spot 5 exceeded the cleanup criteria of 1,000 mg/kg total lead dry weight concentration. The results of confirmatory sampling at Lead Hot Spot 5 are summarized on Table 4-9. Due to the inability to reasonably define the outer limits of this hot spot, all Phase I and Phase I_R work was halted. Lead Hot Spot 5 was remediated at a later date as part of the Phase II scope of work. Refer to Section 4.3, Phase II Remedial Activities, for a description of the removal actions and related confirmatory sampling.

Lead Hot Spot 6

Lead Hot Spot 6 required several iterations of tilling and sampling two-foot-wide intervals before horizontal boundaries containing soil with lead concentrations below the cleanup criteria were identified. Once the horizontal extents of removal were identified on the four perimeter sides of Lead Hot Spot 6, approximately one foot of soil was excavated, placed in supersacks, transported, and secured on the decontamination pad in the Northern Process Area. Then, the bottom of the excavation was tilled to an approximate depth of six inches and a base confirmatory sample was collected and analyzed for total lead. Lead Hot Spot 6 did not require further removal actions, because the lead concentration of the base confirmatory sample was below the cleanup criteria.

Figure 4-11 illustrates the Phase I and Phase I_R final limits of removal for Lead Hot Spot 6 and the perimeter and base confirmatory sample results. The results of confirmatory sampling are summarized on Table 4-10.

Lead Hot Spot 6 was backfilled with off-Site borrow material obtained from a source which was analyzed and found to be free of contamination. The backfill was compacted until non-movement of the fill was observed beneath the heavy equipment used to perform the work. The finish surfaces were smooth graded without irregular surface transitions.

Although confirmatory sampling around Lead Hot Spot 6 defined the limits of soil that needed to be removed, subsequent Phase II sampling showed that the area further out and around it needed to be removed. As a result, Lead Hot Spot 6 was included in the Phase II excavation area. The area around Lead Hot Spot 6 was further remediated later. Refer to Section 4.3, Phase II Remedial Activities, for a description of the removal actions and related confirmatory sampling.

Lead Hot Spot 7

Lead Hot Spot 7 required only one interval of confirmatory sampling to delineate a horizontal boundary of surface soil whose lead concentration was lower than the cleanup criteria. Once the analytical results from the first interval around Lead Hot Spot 7 were reviewed and verified to be less than the cleanup criteria, the soil in the 10′ × 10′ area was removed to an approximate depth of one foot and placed in 1-cubic yard supersacks. The supersacks containing the excavated soils from Lead Hot Spot 7 were transported and staged at a secure area on the decontamination pad located in the Northern Process Area.

Following excavation of the 10′ x 10′ area, the bottom was tilled to a depth of six inches. A composite sample was collected from the base and analyzed for total lead. Lead Hot Spot 7 did not required further removal actions because the base confirmatory sample was below the cleanup criteria. The results of the confirmatory sampling of Lead Hot Spot 7 are summarized in Table 4-11. Figure 4-12 illustrates the final limits of removal and the results of the perimeter and base confirmatory sampling.

Lead Hot Spot 7 was backfilled with off-Site borrow material obtained from a source which was analyzed and found to be free of contamination. The backfill was compacted until non-movement of the fill was observed beneath the heavy equipment used to perform the work. The finish surfaces were smooth graded without irregular surface transitions.

4.2.5 Railroad Tie Removal

A diligent effort was made to locate and identify railroad ties from three old sidings that were previously utilized on the Site. Figure 4-1 illustrates the locations of the former rail lines. A field inspection was conducted in April 1996 because the amount of vegetation that could hinder locating the ties was minimal. The locations of all ties identified during the April reconnaissance were marked with surveyor's flagging. The majority of the ties were found in the Phase II Removal Area of the Site.

Prior to disposal, the ties were stockpiled on 6-mil polyethylene sheeting at a central staging area and then covered with 6-mil polyethylene sheeting. The railroad ties were eventually loaded and disposed with the Phase II non-hazardous soils at the BFI Carter Valley Landfill located in Church Hill, Tennessee.

4.3 PHASE II REMEDIAL ACTIVITIES IN THE VICINITY OF THE FORMER WOOD PROCESSING FACILITY

4.3.1 Introduction

The location of the former wood processing facility that was in existence at the Site during the late 1800's and early 1900's covers approximately six acres in the Southern Non-Process Area. Site records and remaining physical evidence present on the Site suggest that a tannin extraction plant was located within the wood processing facility. In addition, a local Damascus senior citizen recalled several lagoons present on the Site. This facility was used for tannin production and not wood treatment. The tannin extraction process involves the percolation of hot water and caustic over tree bark, with the resultant liquor shipped off-Site to tan animal hides. It is Bayer's hypothesis that this former facility used H_2SO_4 to neutralize caustic. In the late 1800s and early 1900s, H_2SO_4 was made using a lead process, and the wastes from this process could have been disposed of among the soils, thereby causing the elevated lead concentrations. The plant may have also used lead as a construction material, or as a liner for the treatment vessels.

Various tests were run on the soils and cinder and slag fill material to try to determine the source of the lead. One test was run to determine what chemical form the lead was in. Bayer's laboratory informally tested several samples and found that the lead in the Southern Non-Process Area soils were primarily in the form of lead sulfate. Bayer also found that the lead sulfate was not mobile in the conditions found at the Site.

Bayer decided to determine if the contamination near Lead Hot Spot 5 was limited to the cinders and slag fill material evident in the area. Therefore, three samples were collected at two separate locations south and east of Lead Hot Spot 5 (Sample Numbers 1 through 6). Each location has a sample collected from the fill at the ground surface, fill 9-12″ below the ground surface, and from native soil 24″ below the ground surface. The results of this sampling are presented in Table 4-12 and revealed that 1) the lead concentration decreased with depth and 2) there was practically no lead contamination in the native material.

Since the elevated lead concentrations seemed to be present only in the fill material, Bayer attempted to determine if the contamination was related to a specific particle size within the fill. A sample (Sample Number LL) was collected from fill material and subjected to sieve analysis in order to define the grain size distribution within the soil. Sample LL was taken from the same spot as sample number BD-IM-144, which had a lead concentration of 79,200 mg/kg. Total lead analysis was conducted on soils with specific

grain sizes to identify possible relationships between lead levels and particle size. Table 4-12 summarizes this sampling event. The results were inconclusive; no indisputable relationship between contamination and grain size was determined.

In order to determine if the lead contamination was limited only to the fill material found within the location of the former wood processing facility, Bayer decided to collect three samples from similar fill material to the north and south of the former wood processing facility. The locations of the three samples, UU, VV, and BD-IM-156 are depicted on Figure 4-14. The three samples were collected from fill material containing slag and cinders along the former railroad spur. The three samples were sieved and only the portion passing through a 4.75 mm size pan was analyzed for total lead. The 4.75 mm pan was chosen because this interval had the highest lead concentration in the sieve analysis conducted on sample LL collected near Lead Hot Spot 5. The analysis of the three samples indicated that the lead contamination was evident only in the fill material in the vicinity of the former wood processing facility. The sample results are presented in Table 4-12.

Bayer concluded from the various tests that there was no specific source of the lead. Instead, the lead was found reasonably uniformly in the vicinity of the former wood processing facility. No additional sampling or investigation activities, beyond the lateral sampling around the former wood processing facility as described below, were considered necessary.

4.3.2 Delineation Sampling

Based on the lack of a specifically defined source for the elevated lead concentrations and the inability to delineate Lead Hot Spots 2, 4 and 5, it was concluded that a comprehensive Phase II sampling program would be implemented. The two main goals of this grid sampling event were to 1) define both the vertical and lateral extent of lead contamination in the soils around Lead Hot Spots 2, 4, 5, and 6, and 2) identify, if possible, the location of the former source of contamination.

A 600′ × 320′ grid system on 40′ centers was designed in the former wood processing facility area of the Site. Samples were collected at 40 foot centers as well as in the vicinity of any building foundations and landmarks (previous RFI sample locations, concrete piers, catch basins, etc.).

One hundred seventy-seven (177) samples were collected at the corners of the 40′ × 40′ areas, as illustrated on Figure 4-15. A summary of the results are included in Table 4-13. The samples were analyzed for total lead at Quanterra Environmental Services in Knoxville, Tennessee (Quanterra). A 12-hour turn-around time for analytical results was provided by Quanterra. The short turn-around time permitted review of the results of the previous day's samples before activities commenced on the following day. The short turn-around time also enabled the sampling event to be efficient and minimized the number of samples collected and the duration of the IMs work.

Bayer collected data that could possibly identify the depth of contamination, as well as the lateral position, in hope of identifying the source. Samples were collected as follows: 1) a composite of the full depth of any fill material (usually 1-2 feet of cinder, slag, etc.) and from 2) a sample of the native soil (usually brown sand with some gravel) immediately beneath the fill. Review of the analytical results indicated that the contamination was prevalent in the fill material but was not identified at elevated concentrations in the native soil. The results of the grid sampling including the native soil analysis are illustrated on Figure 4-16.

Sampling continued until an area was delineated that met the same clean-up criteria as the Phase I work. Specifically, soils outside the removal area had to possess total lead concentrations less than 1000 mg/kg and the quadrant average of the 95% UCL of the arithmetic mean had to be less than 400 mg/kg. The limits of excavation of the Phase II Removal Area were bounded by samples from soils with lead concentrations less than the cleanup criteria. Figure 4-17 illustrates the limits of the Phase II Removal Area and the results of the Phase II grid sampling in the area. The limits of the Removal Area encompassed four of the hot spots that required remediation (Lead Hot Spots 2, 4, 5, and 6) and a large volume of concrete debris from the foundations of the former wood processing facility area. Much of the removal area was located in densely wooded portions of the Site.

Seven locations on the Phase II grid system in the wood processing facility area of the Site were found to have highly elevated lead concentrations (5,200 mg/kg to 53,000 mg/kg). These seven hot spots (Phase II Hot Spots a, b, c ,d ,e ,f , and g) are depicted on Figure 4-18. A 10′ × 10′ area was defined around each of these sample locations to delineate the limits of excavation for each of the seven Phase II Lead Hot Spot areas. Four corner stakes and caution tape were used to segregate the hot spots from the surrounding non-hazardous soils.

4.3.3 Waste Characterization

Waste characterization of the Phase II Removal Area soils was performed at the request of Mr. Nat Smith, Environmental Specialist, from the Tennessee Division of Solid Waste Management. The sampling locations and requirements were coordinated with all parties and agencies involved including the USEPA, Bayer, the state agencies, and the disposal companies where the wastes would ultimately be disposed. Copies of the correspondence are contained in Appendix C. A description of the process is provided below.

As was done during the Phase I removal efforts, a pre-removal waste characterization sampling strategy was employed during the Phase II work. The only exception to this was that the seven Phase II Hot Spots (a through g) were removed and placed into 33 supersack containers. Prior to disposal, a grab sample was collected from each of the 33 supersacks. The grab samples were composited into one sample (BD-IM-216) and sent to Bayer for analysis of Total RCRA Metals and TCLP RCRA Metals. The sample results are presented in Appendix A (Damascus Closure - November 27, 1996). Based on the elevated TCLP lead content (7.89 mg/L), the soil removed from all seven of the Phase II Lead Hot Spots was classified as hazardous waste. Refer to Sections 4.3.4 and 4.3.5 for a description of disposal and confirmatory sampling.

The Tennessee Division of Solid Waste Management requested that the Phase II Removal Area be divided into ten sub-areas, as illustrated on Figure 4-18. These Phase II Sub-Areas were designated as A, B, C, D, E, F, G, H, I, and J. For waste characterization purposes, six to eight grab samples were collected within each of these sub-areas and composited into one sample per sub-area, resulting in a total of ten samples. These ten samples (BD-IM-179 through BD-IM-189) were analyzed for Total RCRA Metals and TCLP RCRA Metals at Quanterra Environmental Services, located in Knoxville, Tennessee. Appendix A presents the results of the analyses. The locations of the Phase II waste characterization samples are depicted on Figure 4-18.

Based on the laboratory results and written approval from the State of Tennessee, soils in Sub-Areas A, B, D, F, G, I, and J were determined to be non-hazardous. However, the Phase II Lead Hot Spots located within these sub-areas (the 10′ x 10′ area around the Hot Spot) had already been excavated and characterized as hazardous waste.

Samples collected in Sub-Areas C and H revealed elevated, but non-hazardous, TCLP lead results. At the request of the Tennessee Division of Solid Waste Management, both Sub-Area C and Sub-Area H were further divided into four quadrants. Grab samples were collected from five spatially distributed locations within each quadrant and composited into one sample per quadrant for analysis. Four samples were collected from Sub-Area C (BD-IM-194 through BD-IM-197) and four samples were collected from Sub-Area H (BD-IM-190 through BD-IM-193). These eight samples were analyzed for Total Lead and TCLP Lead. Results of the analysis for Sub-Area C and Sub-Area H are presented in Appendix A (Damascus Closure - November 27, 1996), and also illustrated on Figures 4-19 and 4-20.

Based on the Total Lead and TCLP Lead results and written approval from the State of Tennessee, all of the soils in Sub-Area C and Sub-Area H were classified as non-hazardous waste. As described above, the three 10′ × 10′ Phase II Lead Hot Spots located in these sub-areas (Hot Spots c, d, and e) had previously been characterized separately as a hazardous waste.

The TCLP lead result (25.9 mg/L) for the sample in Sub-Area E indicated that the soil in this sub-area was hazardous. This sub-area was enclosed with caution tape to segregate it from the non-hazardous areas.

Bayer ran two TCLP lead extractions from samples previously collected during the grid sampling at Lead Hot Spot 5. The samples (BD-IM-134 and BD-IM-147) were originally analyzed for total lead and were found to contain lead concentrations of 24,362 mg/kg and 16,195 mg/kg, respectively. The TCLP lead extractions (51.1 mg/L and 15.7 mg/L) were utilized for waste profiling. The results of the analysis are included in Appendix A (Damascus Closure - September 24, 1996).

4.3.4 Removal and Disposal

Once the boundary of the Phase II removal activities was defined, a significant effort was required to prepare the work area. First, the area was cleared and grubbed to allow the construction of temporary haul roads and permit access by heavy machinery. Concurrently, erosion and sedimentation controls were installed to minimize the effect of surface water runoff in the removal area.

The first removal action to be conducted in the Phase II Removal Area was the excavation of the seven individual Phase II lead hot spots. The seven areas were excavated until all fill was removed and native soil was encountered, an approximate depth of two feet. The removed soils were placed in thirty-three (33) one-cubic yard supersack containers before initiating any other removal. The supersacks were staged at a secure location in Sub-Area E.

Removal and disposal of soil from the nine non-hazardous sub-areas followed removal of the seven Phase II Lead Hot Spots (a through g). This non-hazardous soil removal included the excavation of Lead Hot Spots 2 and 4. Although Lead Hot Spot 6 was within the Phase II Removal Area boundaries, Lead Hot Spot 6 was removed as part of the Phase I Remedial Activities. During the Phase II Remedial Activities, excavation continued around the perimeter of the backfilled Lead Hot Spot 6. Following characterization and written approval from the State of Tennessee, approximately 7,500 tons of non-hazardous soils from the Phase II removal actions were manifested appropriately, loaded directly into trucks and transported by Jones Trucking to the Carter Valley Landfill operated in Church Hill, Tennessee by Browning Ferris, Inc. (BFI). All non-hazardous waste manifests are on file at ICF Kaiser Engineers, Inc. office in Pittsburgh, Pennsylvania. The Phase II Removal Area was excavated until native soil was encountered, an approximate depth of two feet.

Concrete foundations from the wood processing facility area were also removed as part of the Phase II work. The foundations were usually above the ground surface, with minimal portions buried. Therefore, only the lower surfaces of the concrete debris had been in contact with soil. A small amount of residual soil was diligently removed using brushes, shovels and other hand tools prior to loading into trucks owned by Farmers Construction. Approximately 500 tons of concrete debris were transported to Pools and Spas, a local business, for use as fill material.

The hazardous soil from Sub-Area E, which included Lead Hot Spot 5, was the final waste removed and disposed during the Phase II work. Sub-Area E was excavated until all fill was removed and native soil was encountered. The soil, stumps, and access road materials (stone and geotextile fabric) were loaded directly into dump trailers provided by Wills Trucking, Inc.. Hazardous waste manifests with waste code D008 were completed for each of the sixty-six loads that were shipped to Laidlaw Environmental Services' (Laidlaw) secure landfill in Pinewood, South Carolina (EPA ID# SCD070375985). Copies of all manifests are on file at ICF Kaiser Engineers, Inc. office in Pittsburgh, Pennsylvania. The 1,500 tons of hazardous waste disposed by Laidlaw included the 33 supersack containers with soil from the seven Phase II Lead Hot Spots (a through g). The waste was stabilized by Laidlaw to ensure that land ban requirements for lead were met prior to landfilling.

4.3.5 Base Confirmatory Sampling

Post-excavation confirmatory sampling in the Phase II Removal Area was performed in accordance with USEPA guidance described in correspondence dated September 30, 1996. The USEPA suggested that ten confirmatory samples be collected at the base of the Phase II Removal Area excavation following removal of contaminated soils. Five of these samples were to be collected from locations where the five highest surface concentrations were collected during the Phase II Grid Sampling. The remaining five samples were collected from locations distributed evenly within the excavated area to provide for spatial distribution

In reality, fourteen confirmatory samples were collected from the base of the Phase II Removal Area excavation. The first seven samples were collected (one each) at the base of the Phase II Lead Hot Spots (a, b, c, d, e, f, and g) since these 10′ × 10′ areas had the highest surface concentrations of lead found in the Phase II grid. The base was tilled and a confirmatory sample was collected from the base of each hot spot. Only Phase II Hot Spot e required removal of an additional one foot of soil from the base and a second round of base confirmatory sampling. Two additional base confirmatory samples were collected at locations east of Lead Hot Spot 5. These locations had surface lead concentrations, identified during the grid sampling activities surrounding Lead Hot Spot 5, of 79,200 mg/kg and 24,362 mg/kg. Five additional base confirmatory samples were spatially distributed within the limits of the Phase II Removal Area. The results of all the Phase II Removal Area base confirmatory samples are included in Table 4-14. The locations of the Phase II base samples are depicted on Figure 4-21.

4.3.6 Backfilling

Once the analytical results of the confirmatory samples were reviewed and verified, the entire Phase II Removal Area was backfilled with off-Site borrow material obtained from a source which was analyzed and found to be free of contamination. The backfill was compacted until non-movement of the fill was observed beneath the heavy equipment used to perform the work. The finish surfaces were smooth graded without irregular surface transitions.

4.4 WAREHOUSE BUILDING DEMOLITION ACTIVITIES

A 60′ × 140′ foot one-story concrete block building was the only permanent structure remaining on-Site at the beginning of the IM work. This former Warehouse building was once used as a RCRA storage area, but was closed in 1988 in accordance with RCRA procedures. In order to facilitate placement of the Northern Process Area soil cover, improve local stormwater drainage, and to eliminate future maintenance and liability, the building was demolished as part of the IMs.

4.4.1 Asbestos Abatement

A sample of the roofing on the Warehouse building (BD-RM-007) was collected at the onset of the IMs to determine if any asbestos-containing material (ACM) was present. Refer to Appendix A (Damascus Closure - August 26, 1996) for a report of sampling. This sample was collected by ICF Kaiser personnel possessing current certification to perform such work in the Commonwealth of Virginia. The sample was analyzed by Bayer Laboratories located in New Martinsville, West Virginia. The analysis was performed by ashing the sample below 500°C and gravimetrically determining the percent residue. The identity of the residue was made by microscopy and confirmed by measurement of the specific gravity. The reference for the procedure is EPA/600R-83.116.

Results of the sampling indicated that the Warehouse roofing material contained 7% asbestos. A material is defined as ACM if the asbestos concentration is greater than 1%.

Due to the presence of ACM, a licensed asbestos contractor, E. Luke Green Company Inc., was hired to perform the asbestos abatement work on the warehouse. The scope of abatement work included removing roofing materials down to the wood deck, performing air monitoring throughout the course of abatement activities, transporting and disposing of all debris, and providing all USEPA and Occupational Safety and Health Administration (OSHA) documentation.

Approximately 10,000 square feet (13.03 tons) of ACM roofing material was removed from the roof of the building without the use of any containment. The area around the building was cordoned off and the material was removed by trained workers using hand tools. The ACM debris was placed into a chute that directed the debris into lined roll-off containers. The ACM wastes were transported under manifest and disposed at the Iris Glen Landfill in Johnson City, Tennessee.

Air sampling was conducted at three stations during the course of the asbestos abatement. One station was located in the work area on the roof, one station was located near the loading zone at the roll-off container, and the other station was located at the eastern perimeter of the work area. The results of all air sampling were below the clearance criteria of 0.01 fibers per cubic centimeter (f/cc) as per USEPA protocol and NIOSH 582 procedures. The air sampling results are included in Table 4-15.

4.4.2 Demolition

After removal of the ACM, demolition of the Warehouse building was performed by Farmers Construction Company. The demolition activities included removing the wood roof over the loading deck, steel roof trusses, all old (out-of-service) electrical and sprinkler fixtures from the interior of the building, and the walls, floor, and foundation. Intact wood beams and planking were taken off-Site by Farmers for future construction. The unusable wood debris was disposed as non-hazardous construction debris at BFI's

Carter Valley Landfill. The sprinkler fixtures and other metal debris were hauled off-Site by Farmers and sold to a scrap dealer.

The 17 steel roof trusses, each one approximately 60 feet in length and 7.5 feet high at the center, were saved and will be donated to the City of Damascus. In order to perform the work without incurring any damage, a 100-ton capacity crane was utilized to safely remove and lower the trusses to the ground. The trusses are currently stored in the Northern Process Area until the City of Damascus determines a permanent use and location.

Following removal of the steel trusses, the concrete block building was dismantled with heavy equipment. The masonry debris was taken off-Site by Farmers Construction to be recycled as road bedding on their property across State Route 716 from the Site.

The concrete floor of the Warehouse building was elevated above the surrounding Northern Process Area topography. After the masonry debris was removed from the Site, the concrete floor and foundation walls were dismantled using heavy equipment. Approximately 540 tons of broken concrete were hauled off-Site to a local business, Pools and Spas, and utilized as fill.

The building foundation was filled with soil beneath the floor. There is no evidence of any on-Site excavations large enough to generate the soil needed to fill in the foundation. It was therefore assumed that the soil had been acquired from an off-Site source. No sampling was proposed in the Work Plan. However, Bayer decided to test the soils to verify the original hypothesis. The foundation soils were analyzed by Bayer for total lead, and were found to be free of contamination. The soil was consequently utilized as part of the Northern Process Area soil cover (Refer to Section 4.5).

4.5 NORTHERN PROCESS AREA SOIL COVER PLACEMENT

A cover of clean soil was placed over the entire Northern Process Area in order to improve stormwater drainage. The area covered was approximately 227,500 square feet. The soil was applied to an average depth of approximately one foot. One surface soil hot spot (Lead Hot Spot 1) was removed before placement of the soil cover.

Prior to pacing the soil cover, silt fence was installed along the western edge of the Northern Process Area adjacent to Beaverdam Creek. Following the implementation of the erosion and sedimentation controls, the entire Northern Process Area was prepared for soil placement. The clearing work was limited to mowing the grass, trimming around trees and existing monitoring wells, and removing undesirable vegetation.

As part of the IM planning process, the Northern Process Area was surveyed and a topographic map was constructed. The topographic map is included as Figure 4-22. The soil cover was then redesigned to provide the appropriate drainage of the property based on the surveyed topography. The soil cover was redesigned after the zoning application was submitted and approved by the City of Damascus via the Mount Roger's Planning Council. As a consequence of the revised design requirements, a revision to the Erosion and Sediment Control Plan (ICF Kaiser, 1996) for the Northern Process Area was submitted to the Washington County Building Inspector.

The revised grading plan required that the soil cover be placed with a 1% slope from south to north. The original Erosion and Sediment Control Plan required the soil cover to be placed with a 1% slope from east

to west toward Beaverdam Creek. The revised grading plan also required that drainage swales be constructed within the Northern Process Area in order to divert surface water from east to west toward Beaverdam Creek. Appendix B contains both the original and the revised Erosion and Sediment Control Plan drawings.

The off-Site borrow material that was utilized for the Northern Process Area soil cover was obtained from Farmers Construction Company (Farmers) in Damascus. Farmers owns a large piece of property directly across State Route 716 from the Site and was in the process of leveling a large portion of a hillside to develop their land. The land was forested and had never been used for industrial purposes. Access roads to the borrow pit were constructed before removing any material. The required erosion permit was secured and maintained by Farmers. Erosion and sedimentation controls including silt fence, straw bales, temporary construction entrances, sloped roadbeds, and expedient reseeding were utilized in the borrow pit throughout the work.

Soil from the borrow area was sampled prior to excavation in order to ensure that the soil was acceptable for use at the FTDP. Four soil samples were collected and sent to the Bayer Corporation's Environmental Laboratory (Bayer) in New Martinsville, West Virginia. They were scheduled to be analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and RCRA metals. However, the samples could not be analyzed because the bottles were received at the laboratory with a temperature greater than 4° Celsius. The unacceptable temperature of the samples was the result of the shipment delays caused by the courier. Subsequently, two new soil samples (BD-BA-005 and BD-BA-006) were collected from the borrow area and forwarded to the Bayer laboratory, and analyzed for VOCs, SVOCs, and RCRA metals. No contamination was found in the borrow material. The results of the borrow area analyses are presented in Appendix A (Damascus Fill Soil - June 13, 1996).

Soils used to construct the Northern Process Area cover were hauled to the Site by truck. Loads were end dumped at a location in close proximity to where the soil was placed. Heavy tracked equipment was then used to spread and compact the soil cover to the grade lines that were identified on survey stakes. Truck drivers and equipment operators took great care not to move or damage grade stakes, small trees, and monitoring wells that remained in place throughout the course of the work.

Soil from within the elevated foundation of the Warehouse Building was also used as part of the soil cover. Two samples (BDWH1 and BDWH2) were collected from the foundation soils and were analyzed for total lead before the soil was distributed for the soil cover. The total lead concentrations were 56.3 mg/kg and 53.7 mg/kg, respectively. The results are included in Appendix A (Damascus Closure - September 24, 1996). The warehouse soil was then spread evenly near the former building, following demolition activities.

Following placement of borrow material, drainage swales were constructed to convey surface water toward Beaverdam Creek. To minimize erosion, permanent vegetation was established in the Northern Process Area immediately following completion of earthwork activities (Refer to Section 4.8.3). Small pine trees were also planted along the northern and eastern perimeter of the fenceline to enhance the natural appearance of the area and to provide additional erosion control.

4.6 PERIMETER FENCE REPAIR

In order to restrict access to the Northern Process Area, the existing perimeter fencing was reconfigured to have only one access gate and no other openings or gaps. The fence will serve to separate the Site into two distinct parcels of land in the future, the Northern Process Area to be kept by Bayer and the Southern Non-Process Area which may be given to others. Rio Grande Fence Company was contracted to remove the five gates originally located in the Northern Process Area of the Site and replace those sections with new nine gauge chain-link fence, top rails, barrier supports, and couplers. The old gates were staged in the Southern Non-Process Area and subsequently removed from the Site by Farmers Construction Company to be sold as scrap metal. In addition, Rio Grande repaired and/or replaced all damaged Site perimeter fencing.

4.7 PIEZOMETER INSTALLATION

In comments dated September 30, 1996, the USEPA raised a concern that groundwater was not adequately characterized in the southernmost section of the Site (the Southern Non-Process Area, near the Phase II excavation). The reason for this concern was the unexpectedly high concentrations of lead found in the area, and the lack of an explainable source. A hydro-punch/temporary well point sampling event was requested in order to evaluate the groundwater in the Phase II Removal Area and to determine if other releases, associated with operations of the facility formerly located in this vicinity, had occurred. A minimum of three downgradient and one upgradient groundwater sampling locations in the Southern Non-Process Area were requested, with groundwater elevations to be collected in order to demonstrate that the wells were positioned properly. USEPA requested that samples be analyzed for VOCs, SVOCs, and metals.

As stated in ICF Kaiser's Response to Comments dated November 1, 1996, three rounds of groundwater samples were collected during the RFI from each of three monitoring wells (DM-19, DM-21, and DM-25) located along the northern edge of the Phase II Soil Excavation Area. These three wells are downgradient of a former wood processing facility, based on RFI groundwater maps. The samples were analyzed for VOCs, SVOCs, and metals. Results of these samples indicated no VOC detections. SVOC analysis revealed only bis(2-ethylhexyl)phthalate in samples collected from all three wells. The bis(2-ethylhexyl)phthalate detections were qualified with a "B" that indicates the compound was detected in the blank associated with these samples. Metals analyses indicated lead concentrations of 17.8 µg/l, 2.7 µg/l, and 3.2 µg/l in wells DM-19, 21, and 25 respectively. The concentration of lead in DM-21 and 25 were qualified "J" indicating that the values were estimated due to detection below the method detection limit. The lead values observed in these wells were in unfiltered aliquots. The filtered samples from those wells did not indicate the presence of lead.

However, it is true that no wells exist south of the Phase II Removal Area, and therefore gradients in that part of the plant were extrapolated. In order to confirm groundwater flow in the vicinity of the Former Wood Processing Facility area, ICF Kaiser installed three temporary piezometers in the Southern Non-Process Area at locations shown on Figure 4-22. Each of the three piezometers was constructed of two five-foot pieces of 2" diameter PVC pipe and one five-foot piece of Schedule 40, 8 slot screen. A hole approximately 2' in diameter was excavated a minimum of three feet into the water table. The excavations were approximately 12.5, 10.5, and 12.2 feet deep for piezometers PZ-1, PZ-2, and PZ-3, respectively. The 2" diameter PVC pipe was inserted into a 6" diameter PVC pipe. The annulus created between the

pipes was filled with sand. The excavation was then backfilled, and the 6" diameter PVC pipe was removed, thereby creating a sand filter surrounding the screen.

Following construction, the piezometers were allowed to stabilize for three days. The piezometers were surveyed (in three dimensions) by Glen F. Phillips and Company. Water levels were measured at the piezometers and at fourteen of the shallow on-Site wells. The water surface elevations are provided in Figure 4-23.

As illustrated by the groundwater contours shown on Figure 4-23 the data from the temporary piezometers confirmed that groundwater flows south to north in the southern end of the Site. Wells DM-19 and DM-21 are directly downgradient of the area of high lead and they have proven to be clean. Bayer concluded that no further sampling was considered necessary. Furthermore, the historical lead processing facility formerly located in the Southern Non-Process Area of the Site was used for tannin production and not wood treatment. No wood preservation, dying or treating activities, involving chemicals such as arsenic, chromium, creosote, or pentachlorophenol, were conducted at the Site. In light of this additional data, it was determined that the groundwater in the vicinity of the Southern Non-Process Area has been adequately characterized.

4.8 DEMOBILIZATION ACTIVITIES

Demobilization activities began the week of November 18, 1996 and ended on November 24, 1996. Activities conducted during demobilization included decontamination of tools and heavy equipment, demolition and disposal of the concrete decontamination pad located in the northern process area, final vegetation establishment throughout the Site, and termination of utility services.

4.8.1 Decontamination Activities

All decontamination activities conducted during the course of the work were completed in accordance with the Field Sampling/Waste Management Plan (ICF Kaiser, 1996b). Tools which were decontaminated prior to being taken off the Site included shovels, picks, trowels, stainless steel bowls, spoons, digging bars, etc., that were utilized to perform intrusive activities. The fluids were collected in 55-gallon drums that were securely staged on the decontamination pad. Approximately 200 gallons of decontamination fluids were generated during the entire IM implementation. As part of the disposal of hazardous waste from the Site, the 200 gallons of decontamination fluid were discharged into and fully absorbed into the soils from Phase II Sub-Area E and disposed as hazardous waste. No other decontamination fluids, other than that from hand tools, were generated or disposed. The empty collection drums were crushed and also disposed as hazardous waste.

The procedure used to decontaminate heavy equipment was not the same as the procedure for hand tools. In order to minimize the amount of fluids that require disposal, steam cleaning was not utilized during heavy equipment decontamination activities. Instead, dry methods were employed. Solids built up on the exterior of heavy equipment were painstakingly removed by manual methods, using brushes, shovels, picks, and other sharp objects. The removed solids were containerized and disposed with the hazardous soils.

4.8.2 Decontamination Pad Demolition

The concrete decontamination pad located north of the Site trailer was removed utilizing standard demolition practices. Caution was taken to minimize the amount of dust generated during the demolition. Following removal of the concrete, the area was backfilled with off-Site borrow material and graded in accordance with the erosion and sediment control plan drawings. Approximately 25 tons of concrete debris were hauled off-Site by Farmers and taken to Pools and Spas, a local business, for use as fill. The discharge line, which drained the pad and the sanitary facilities in the Site office trailer to the local sewer system, was closed by permanently sealing the annulus with cement in accordance with Washington County Water Authority requirements.

4.8.3 Final Vegetation Establishment

Approximately 522,000 square feet of permanent vegetation was established in order to minimize soil erosion in all removal areas, stormwater swales, and on the Northern Process Area soil cover. All seeding utilized native grasses and was conducted in accordance with *Virginia Erosion and Sediment Control Handbook* requirements. Mulch, lime, and fertilizer (16% nitrogen, 27% phosphorous, 14% potash) were applied with the seed by the hydroseeding method. Table 4-16 illustrates the type of grasses planted on the Site. Heavy equipment operations sufficiently scarified areas that were seeded. Temporary seeding was not required because hydroseeding with permanent seed was accomplished within thirty days of activity completion.

Seeded areas were inspected prior to leaving the Site to determine the extent of revegetation. Areas where grass had not grown were reseeded as necessary. A future visit will be necessary to assess seeding efforts and remove or replace silt fencing. This will be conducted in the Spring of 1997 concurrent with remaining punch list completion activities. At this time, any additional revegetation will be completed.

In order to enhance the appearance of the Site, wildflowers, and small trees were planted in the Northern Process Area. The wildflower seeds planted were determined by a landscape architect, Habitat By Design, and are listed in Table 4-17. Packets containing a total of approximately 12 pounds of seeds were provided by the landscape architect. As per the instructions provided by Habitat By Design, the wildflowers were established from seed and scattered by handseeding in drifts. Several small pine trees were planted around the north area perimeter.

4.8.4 Facilities/Utilities Removal

All construction records, equipment, and supplies belonging to both Bayer and ICF Kaiser were packaged and shipped to Pittsburgh to be archived in the appropriate project files. The utility companies were notified and the sewers to the Site trailer were disconnected one week prior to personnel leaving the Site. The sewage line was closed by neat cementing the office as per building code requirements.

The Site trailer will be donated to the City of Damascus. When weather permits, the empty trailer will be moved to the Southern Non-Process Area where it will be stored.

4.9 GROUNDWATER MONITORING WELL ABANDONMENT

On February 10, 1997, ICF Kaiser mobilized equipment and personnel to the Site to abandon 20 on-Site groundwater monitoring wells and one off-Site groundwater monitoring well that were installed during the RFI. Three temporary piezometers that were installed during performance of the IMs were also abandoned during this work.

Prior to mobilization, the USEPA was notified by Bayer that the wells would be abandoned by overdrilling with an air rotary rig and the abandoned wells sealed using a bentonite clay/cement grout. Bedford Environmental Services (Bedford) of Blue Ridge, Virginia, was sub-contracted to ICF Kaiser to perform these services.

An attempt was made to overdrill wells at several locations. The overdrilling was not successful because the bentonite, cement, clay, and sand used to construct the wells fell into the opening as the augers were retrieved. After a discussion with an ICF Kaiser geologist, certified in the Commonwealth of Virginia, the wells were abandoned by bursting the bottom of the 4-inch PVC casings and pumping the grout from the bottom of the well to the top of the casing. After the grout solidified, the PVC casing and solid grout were removed approximately 4 feet below the ground surface. Grout was then placed from the point where the PVC was broken to just below the ground surface to form a solid plug at the top of the former well.

Two bedrock wells were abandoned by the same method, except the casings were made from steel instead of PVC. These two wells were grouted solid with the steel casings in place. Then, the steel casings were cut off at a point approximately 4 feet below the ground surface and a grout plug was constructed from the point where the casings were cut to just below the ground surface.

No wastes were generated utilizing the grout in place method other than the concrete and steel debris from pads, casings, and ballards. Dirt was removed from the debris with brushes and shovels prior to transportation to a staging area in the Southern Non-Process Area. Upon completion of the well abandonment activities on February 11, 1997, Farmers Construction transported the concrete debris to Pools and Spas for use as fill material. Farmers removed the steel debris with the intention of selling the steel to a scrap dealer.

4.10 FINAL SITE WORK

Numerous miscellaneous tasks were conducted during a remobilization of personnel and equipment to the Site during the well abandonment activities. The tasks completed include:

- Placed six to eight feet of riprap material directly under the existing culvert that is under the road and adjacent to the fence that separates the north and south areas.
- Removed and replaced silt fence and straw bales.
- Hauled the Site trailer to the Southern Non-Process Area entrance.
- Finished soil cover grading in the Northern Process Area after trailer removal and well abandonment.
- Regraded the drainage swale in the northern end of the Southern Non-Process Area.